

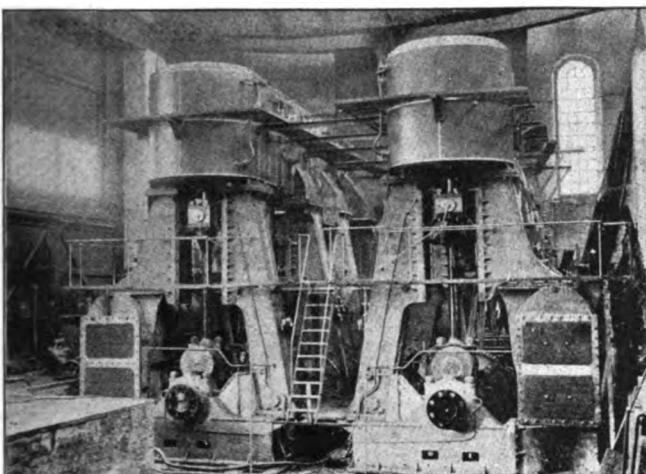
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NO. 14.

TWIN-SCREW STEAMSHIP DONGOLA

The Dongola, the latest addition to the already extensive fleet of the Peninsular & Oriental Steam Navigation Co., launched Sept. 14, 1905, has been constructed by Barclay, Curle & Co., Ltd., at their Clydeholm shipyard, near Glas-



ENGINES OF THE DONGOLA.

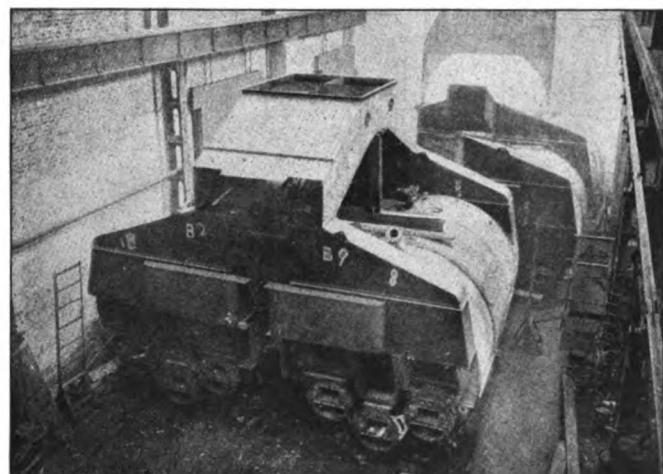
gow. This fine vessel is one of a class of P. & O. steamers which has been specially designed for the eastern mail service of the P. & O. Co., and in her combination of speed, spacious and luxurious passenger accommodation, with large measurement and deadweight carrying capacity, presents an exceedingly good specimen of a modern type of steamship which combines in one structure the qualities formerly obtained in two or more different types of vessels. Messrs. Barclay, Curle & Co., Ltd., have made a specialty of this type of vessel, and constructed a large number of somewhat similar steamers for several of the leading steamship companies of Great Britain. The leading particulars of the vessel are:

Length over all, 490 ft.; breadth, extreme, 56 ft. 5 in.; depth from bottom of keel to top of deck at center, 36 ft. 8 in.; gross registered tonnage, about 8,100 tons.

The machinery consists of quadruple expansion twin-screw engines of 8,000 I. H. P., constructed by the builders, designed for a speed at sea of about 15½ knots. The steamer has accommodations for 150 first-class passengers and 100 second-class passengers.

Every effort has been made to obtain construction of the highest class, the vessel having been built under the supervision of the P. & O. Co.'s own staff of inspectors, to the requirements of the Board of Trade for a foreign-going passenger steamship, and under the special survey of the surveyors of Lloyd's Registry for the highest class assigned by that body. In addition, the requirements of his majesty's transport service have been complied with, making the vessel available for the transport of troops in time of war. It only remains to be added that the builders, as in the case of all other vessels constructed by them, have exercised a strict supervision in all details of construction, thus showing that no precaution has been neglected to insure the best obtainable workmanship.

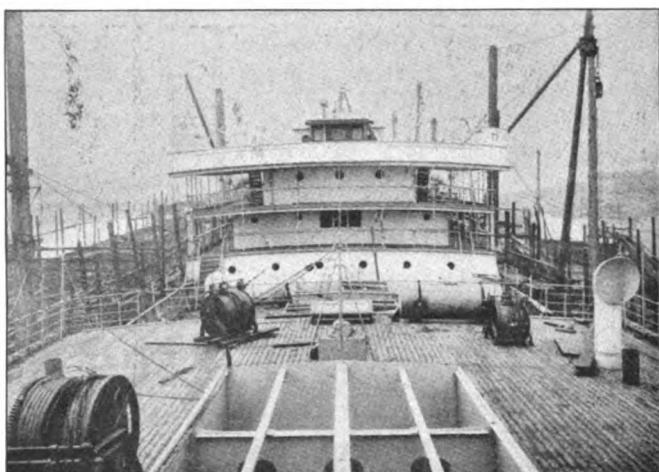
The hull of the vessel generally has been constructed of the best mild steel, manufactured by the Siemens-Martin open-hearth process, the scantlings being in excess of the requirements of Lloyd's in such parts of the structure as have been found by the experience of the P. & O. company to be advisable, not only with the object of providing increased strength, but also to provide a margin against the



BOILERS OF THE DONGOLA.

deterioration which unfortunately occurs, more or less, in all steel vessels.

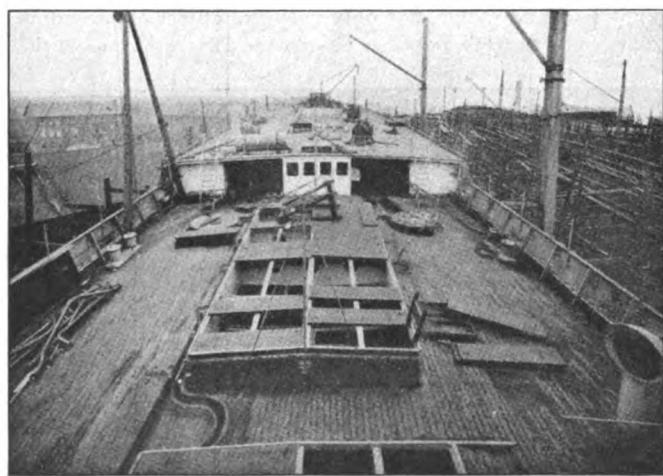
The hull of the vessel is divided into separate watertight compartments, the number of which is in excess of Lloyd's requirements. This insures the flotation of the vessel



DECK VIEW OF THE DONGOLA.

should the skin be pierced in the event of a collision; and in order to provide for her safety in the event of grounding or touching a sunken rock, a complete inner bottom has been fitted all fore and aft, divided by numerous watertight partitions into separate water-ballast tanks, each tank being capable of being filled or emptied independently, so that the trim and draught of the vessel can be adjusted at any time to suit the conditions of service.

Three complete decks are laid all fore and aft—viz., a lower deck of pitch pine, a main deck of steel sheathed with pitch pine, and an upper deck of steel sheathed with teak. Above the upper deck is, at the fore end, a forecastle 103 ft. long, and at the after end a long combined poop and bridge deck 320 ft. long, both of these decks being of steel sheathed with teak. The combined poop and bridge forms the lower promenade deck, which is assigned partly to first and partly to second-class passengers, and above this is fitted the upper promenade deck of teak, 190 ft. long, and assigned entirely to first-class passengers. Above this, again, and in the order stated, are the boat deck, lower navigating deck, and the upper navigating deck, all of teak; the total depth of the

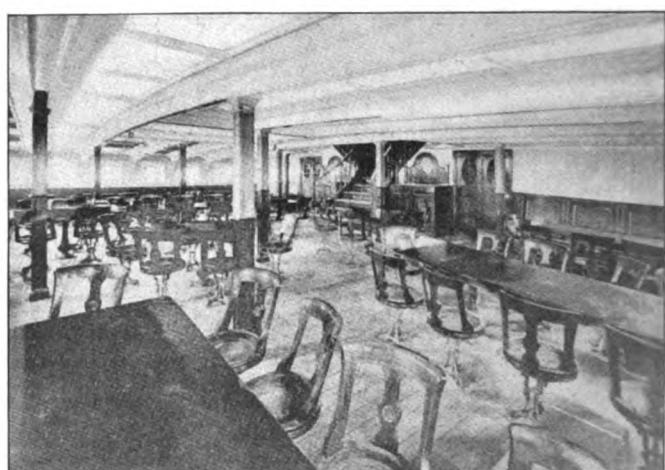


DECK VIEW OF THE DONGOLA.

vessel to the last named deck is not less than 80 ft. or 56 ft. above the level of the water.

Following the usual up-to-date policy of the P. & O. company, the arrangements for passenger accommodation have been designed to give the maximum of space and comfort to each individual who may have the good fortune to make a voyage in this vessel. The first-class passengers are all berthed amidships, where least motion

is experienced in heavy weather, the sleeping cabins being placed partly on the upper deck and partly on the promenade deck. The practice of placing a number of cabins on the promenade deck is one which is becoming general, and these cabins are much sought after by intending passengers on account of their obvious advantage in airiness and convenience. A special feature is the large size of the cabins, which is strikingly shown in the fact that only one row of cabins is fitted on each side amidships, whereas the usual practice in a vessel of this size is to have two rows on each side. In addition to the large size thus obtained, the window of each cabin opens directly on the side of the vessel. The passages are unusually wide, well lighted, and well ventilated. The beds are all metallic, with spring mattresses, and the fittings of the cabins include two patent fold-up lavatories in each room, chests of drawers and writing desks, couches, jewel cases and boot racks, whilst passengers are, according to their temperament, reassured or made more apprehensive by the presence of lifebelts, stowed in racks overhead, so as to be instantly available if required. The ventilation has



FIRST-CLASS DINING SALOON.

received special attention, and the windows are all considerably larger than is usually the case.

The dining saloon, a large and spacious apartment, is situated at the fore end of the upper deck, and extends the full breadth of the ship. Light and air are provided by very large circular lights on three sides of the saloon, and by an open well overhead, which extends through four decks to a large skylight on the upper navigating deck. The decoration of the saloon is quiet, but in good taste, the walls being paneled in inlaid mahogany, with specially designed Tynecastle canvas for the frieze and ceiling. The furniture consists of chairs, tables, handsomely upholstered settees, and side-boards of inlaid mahogany with bevelled glass mirrors. Electric bells, fans and lights are provided here as elsewhere throughout the vessel. Leading from the dining saloon to the music room on the upper promenade deck is a handsome stairway in two flights, with a large open space on the lower promenade deck, giving access to the deck cabins.

The music room is large and comfortable, decorated in inlaid mahogany, with Tynecastle canvas panels on the ceiling and frieze on the walls. It is well lighted by numerous lights on all four sides and by two large skylights overhead. This room, when furnished with pianos, couches, tables, etc., will present a very striking appearance. Direct access is obtained from the music room to the upper promenade deck, and from the halfway landing previously mentioned to the lower promenade deck.

At the after end of the upper promenade is the smok-

ing room, of which a striking feature is the lofty appearance, the ceiling being two feet higher than any other room in the ship. This will modify to a considerable extent the thickness of the atmosphere which usually exists in a smoke room aboard ship. The paneling is of light oak and a deep frieze, and ceiling of Tynecastle canvas, specially designed. Numerous couches, chairs and tables, arranged to divide up the space into small compartments, will, together with the presence of the adjacent bar, make this room one of the most popular on the vessel. Access to the smoke room is obtained through a vestibule lined in fumed oak, from which a stairway leads down to the after vestibule.

The sanitary accommodation is fitted up in numerous small blocks, each complete in itself, placed at different points throughout the passenger accommodation, so as to make it equally accessible to the occupant of any cabin. Porcelain baths with hot and cold water, hot and cold showers, marble topped wash-hand basins with hot and cold water, and all other necessities, are provided in numbers in excess of the usual complement. A special feature is the fact that passengers can go from their rooms to any of the public rooms without going on deck. The second-class passengers are accommodated toward the after end of the vessel, and everything is provided for them on a scale and in a style only inferior to the first class—the dining room, smoke room, entrance hall and sanitary accommodation being all arranged with the same care and attention as the first class.

The stewards' department, one of the most important on a passenger steamer, has received due attention. Large store rooms are provided on the lower deck, and a refrigerated chamber, with separate compartments for preserving meat, game, fish and vegetables, also an ice-making room; the temperature of these chambers being kept at any desired point down to freezing point, through the agency of a refrigerating machine on the dry-air system placed in the engine room. The galley is placed on the upper deck, and is fitted up with cooking ranges, baking ovens, hot-water boilers, grills, bain-maries, and all the usual outfit of a passenger steamer. Adjacent are the baker's shop, with a steam dough-mixing machine, butcher's shop, scullery, vegetable room, etc. Large pantries are fitted adjoining each dining saloon, with hot and cold water, and carving tables heated with steam, so that food may be kept hot whilst serving.

The electric light installation consists of three independent dynamos, each driven by compound coupled engines, and a complete system of electric lighting and fans are fitted throughout the vessel, including navigating lights and large clusters for use when discharging cargo at night.

The ventilation of the vessel is unusually complete as is necessary for the hot climate in which she will run, and includes a special system of ventilation to the troop deck.

The accommodation for the captain and officers is entirely on the navigating deck, so as to avoid any interference in their duties; a large chart room and wheelhouse contains the steering wheel and other navigating appliances; compasses of Lord Kelvin's manufacture, engine room telegraphs, docking and steering telegraphs, speaking tubes to the engine room and captain's room, and loud-speaking telephones to the engine room, forecastle head, and the after end of the vessel complete the appliances fitted for navigating and working the ship.

The engineers are berthed on the upper deck, alongside the entrance to the engine room, with their mess-room and lavatories alongside. The seamen, firemen and stewards are all berthed forward, partly under the fore-

castle deck and partly under the upper deck. As already indicated, the vessel is designed to serve as a troopship when required; the troop deck extends the full length of the vessel, below the upper deck, two watertight doors being fitted in each watertight bulkhead to allow an uninterrupted passage from end to end, and numerous large side-lights are fitted all fore and aft; ample latrine accommodation is placed at the fore end, under the forecastle. The steam steering gear is placed in a steel house immediately over the rudderhead, and is actuated by telemotor gear from the bridge and aft, and hand steering gear is fitted for use in the event of a breakdown of the steam gear. The appliances for mooring the ship consist of cast-steel stockless anchors, stowed in the hawse pipes, with heavy cables of the best quality; a large steam windlass is placed on the forecastle head, with a steam capstan forward; and two steam warping capstans are placed on the poop deck aft. The cargo loading and discharging facilities are unusually complete, five large cargo hatchways being served by six powerful steam cranes, four steam winches, powerful derricks, and a special derrick capable of lifting 30 tons. The safety of the passengers is considered by the provision of fourteen lifeboats, fitted with Capt. Andrew's patent lowering and disengaging gear, and those amidships are fitted on the rail of the promenade deck on Capt. Andrew's principle, so as to leave as much deck space as possible for the passengers. The boats include a large steam launch, capable of steaming 10 knots an hour. Mail rooms and bullion rooms are fitted up on the lower deck aft, built of steel and fitted with Chubb's doors. The space between the twin-screw tunnels is utilized for fresh water tanks, the total capacity being about 40,000 gallons.

The machinery of the vessel, which has been constructed by the builders, consists of two sets of quadruple expansion engines, the diameter of the cylinders being 25½ in., 36½ in., 52 in. and 74 in., with a stroke of 51 in., and the cylinders are arranged to give the best balance possible for smooth and silent working. The advantages due to the absence of vibration will be much appreciated by passengers. The second intermediate cylinder and the low-pressure cylinder are both steam jacked, flat slide valves are fitted to the second intermediate and low-pressure cylinders, and piston valves to the high-pressure and first intermediate cylinders; direct steam starting and reversing gear is fitted, also steam and hand gear for turning engines in port. The surface condenser is horizontal, and is of cast iron, the condensing surface being 12,000 sq. ft. The shafting throughout is forged from the best ingot mild steel, and is all about 10 percent in excess of Lloyd's requirements. In addition to the usual tests demanded by Lloyd's and the Board of Trade, the shafting has been subjected to the P. & O. company's special code of tests. The propellers are three-bladed, with cast-iron bosses and blades of manganese bronze.

The boilers are six in number, two double-ended, 20 ft. long, and four single-ended 11 ft. 6 in. long, all 14 ft. 8 in. diameter, with a working pressure of 215 lbs. per square inch. Each boiler is fitted with three furnaces in each end, 3 ft. 5½ in. in diameter. Forced draft on Messrs. Howden's system is fitted with two fans electrically driven. The total number of furnaces is twenty-four, the heating surface 18,700 sq. ft., and grate surface 470 sq. ft. The machinery is estimated to develop 8,000 I. H. P. on trial, and a speed of 16 knots.

The outfit of auxiliary machinery in engine room is unusually comprehensive, and consists of fourteen separate steam pumps, including circulating and air pumps, feed, bilge, ballast, wash deck, fire, hot and cold fresh

water and sanitary pumps. Steam ash ejectors, feed water evaporator, fresh water distilling and evaporating and filtering plant is fitted in the engine room, as is also the refrigerating machinery and the triplicate set of electric generating plant previously referred to.

From the foregoing description it will be seen that the Dongola is likely to prove a popular and profitable vessel, and she may be considered a good example of a modern steamship of a type that is finding increasing favor with shipowners and the traveling public.

As illustrating the advances that have been made in rapidity of ship construction, it may be mentioned that the keel of this vessel was laid on Jan. 10, 1905, and that she was ready for launching by July 14. Unfortunately, owing to a strike of patternmakers, it was impossible to have the machinery ready for this; but, even with the

delay, the vessel is expected to be handed over to the owners, ready for service, by the end of October, or nine and one-half months from the laying of the keel. Had the strike of patternmakers not occurred she would probably have been ready six weeks earlier, or eight months from beginning work upon the vessel.

A business connection existed between the Peninsular & Oriental Steam Navigation Co. and Barclay, Curle & Co. so far back as the year 1872, when the Zambesi was built. The connection was resumed in 1898 with the Sicilia, and it says much for the amicable relations existing between the firms that since that time at least one and sometimes more steamers have practically, without an interval, been under construction at Clydeholm for the P. & O. company.

Steamer James C. Wallace

An Important Test of Her Machinery under Superheated and Saturated Steam*

The economical advantages in using superheated steam have been recognized for many years, but not until recently has steam engine and steam turbine construction advanced to the point where, from a practical standpoint, the ill effects met with in past years have been overcome. Formerly, the impossibility of obtaining satisfactory metallic and other packing for rods and joints subjected to high temperatures, with the numerous attendant evils, as well as a proper cylinder lubricant, served to delay its general use. Of late years, however, such difficulties have largely disappeared, and in modern practice a temperature of 500 degrees Fahrenheit is readily and successfully handled in steam engines. In foreign countries, notably in Germany, a much higher degree of superheat is being used, but the limit, thus far, in the United States appears to be as stated. This, no doubt, results from the additional expense involved in up-keep incidental to high temperatures.

For the purpose of securing comparative data with superheated and saturated steam, used in the same engine, and by courtesy of the Acme Steamship Co. on the great lakes, a board was appointed, under instructions from the bureau of steam engineering, to carry out tests of machinery on the steamer James C. Wallace. This vessel, which is one of the largest freighters on the lakes, has lately been put into service. She is equipped with two Babcock & Wilcox marine water-tubular boilers with superheaters, and the arrangement is such that the latter may be dispensed with by a few simple changes, and saturated steam used.

The board was composed of Com'dr W. W. White, U. S. N. (retired); Lieut. Com'dr B. C. Bryan, U. S. N., and Lieut. H. T. Winston, U. S. N.

The hull is of mild steel and was built by the American Ship Building Co. of Cleveland, O. A cargo hold, hopper shaped, with girder arches, and without bulkheads, divisions or stanchions, constitutes an important departure and improvement in design. This hopper extends 408 ft. in length, and measures 47 ft. at the top and 29 ft. at the bottom. The adoption of this construction makes it possible, by the use of automatic clams, to unload cargo without hand shoveling.

Length over all, feet.....	552
Beam, feet	56
Depth, feet	31
Number of cargo hatches.....	32
Capacity of water bottoms, tons.....	8,000
Coal bunker capacity, about, tons.....	350

*By Com'dr W. W. White, in the *Journal of the American Society of Naval Engineers*.

The propelling machinery, as is usual in lake vessels, is placed in the extreme after part of the vessel. The boilers are immediately forward of the engine, with an athwartship coal bunker forward of the boiler-room bulkhead. The main engine is of the quadruple-expansion, vertical, direct-acting, inverted, jet-condensing type. One piston valve, actuated by a Joy valve gear, is fitted on the side for each of the high, first and second intermediate-pressure cylinders. The low-pressure valve is a double-ported slide, placed on the after side of the cylinder and operated by eccentrics and a double-bar Stephenson link. All cylinders are unjacketed.

Number of cylinders.....	4
Diameter of H. P., inches.....	18 $\frac{1}{2}$
1st I. P., inches.....	28 $\frac{1}{2}$
2d I. P., inches.....	43 $\frac{1}{2}$
L. P., inches.....	66
Stroke (common), inches.....	42
Diameter of piston rods (one for each cylinder), in.	5 $\frac{3}{8}$
Order of cylinders from forward: (1) H. P.; (2)	
1st I. P.; (3) 2d I. P.; (4) L. P.	
Designed I. H. P.....	2,000
piston speed, feet	560

The following shows the important dimensions of the auxiliary machinery in use during the tests, all of which is independent of the main engine. In addition, in Test II, two fire-room blowers (double simple engine 6 in. \times 5 in.), and two small duplex pumps (2 in. \times 1 $\frac{1}{4}$ in. \times 1 $\frac{3}{4}$ in. stroke), which furnished water circulation through the blower bearings, were in operation.

Number	Purpose.	Make	Type.	Diameter of cylinders.			
				H. P.	I. P.	Water.	Stroke.
1	Main air pump	Blake	Vertical compound	12	20	24	18
1	Main feed pump.....	Blake	Horizontal compound, duplex plunger.....	6	10	5	10
1	Water service pump.	Blake	Horizontal duplex.....	4 $\frac{1}{2}$	3 $\frac{1}{4}$	4	
1	Bilge pump.....	Blake	Horizontal duplex.....	7 $\frac{1}{2}$	5 $\frac{1}{2}$	6	
1	Stoker engine.....		Vertical, one-cyl., simple.....	6 $\frac{1}{2}$			6

A feed-water heater is fitted in the engine room, into which all auxiliaries exhaust. The heater is cylindrical, with 2-in. tubes, through which the feed water is forced in its passage to the boilers. No attempt was made to determine the power of any of the auxiliaries in use.

Steam is supplied by two Babcock & Wilcox boilers of the latest type, designed for a pressure of 250 lbs., with

superheaters and stokers. Plate I shows a sectional, and Plate II a front view of one of the boilers.

The superheater, it will be observed, consists of an upper and lower cross box having a number of bent tubes expanded into them. Steam, after being generated, is led

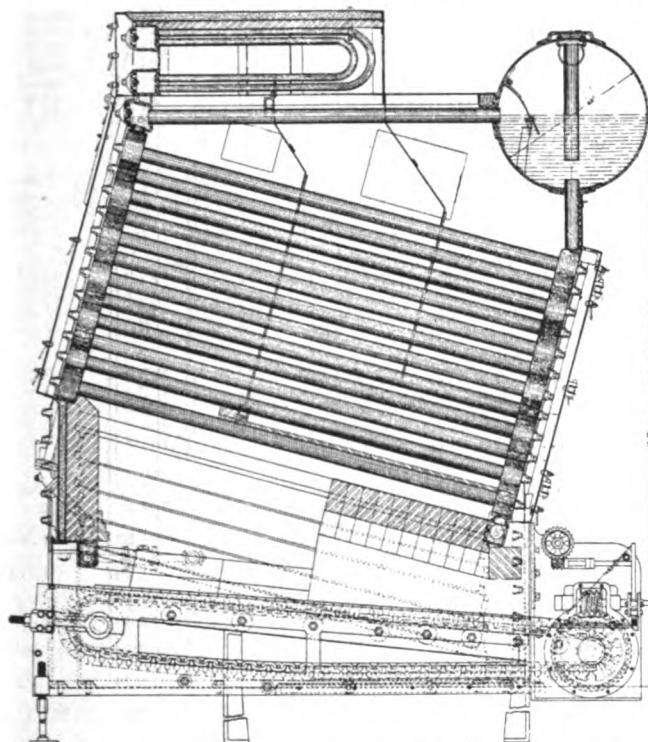


PLATE I. BABCOCK & WILCOX BOILERS ON THE STEAMER JAMES C. WALLACE.

from the drum by an outside pipe to the forward end of the superheater. After passing through the latter, it is directed through another outside pipe, at the after end, to the main steam pipe. One partition is placed in each cross box, thus causing the steam to flow three times from one box to the other in its passage from inlet to outlet.

Suitable valves are installed in the piping, so that the generated steam may be sent either through the superheater, or, if desired, directly to the main steam line.

Length of boiler proper.....	11 ft.
Including projection of stoker.....	14 ft.
Width of boiler.....	12 ft. 2 in.
Height of boiler to top of drum.....	15 ft.
Superheater	15 ft. 8 in.
Diameter of drum.....	42 in.
Length over heads.....	13 ft. 5 in.
Thickness of shell plates.....	19-32 in.
Diameter of boiler tubes.....	4 in.
Thickness of boiler tubes.....	6 B. W. G.
Length of tubes between headers.....	10 ft.
Number of sections wide, each boiler.....	18
Including side sections.....	20
Diameter of superheater tubes.....	2 in.
Thickness of superheater tubes.....	10 B. W. G.
Square feet of grate surface, each boiler.....	74
Square feet heating surface, each boiler.....	2,900
Square feet superheating surface, each boiler	414
Ratio of G. S. to H. S.....	1 to 39.19
Including superheater	1 to 44.78

Each boiler is provided with two chain stokers of the Crowe pattern, all driven by a single-cylinder engine 6½ in. by 6 in. (installed in the engine room and run at constant speed) through shafting, sprocket wheels, chain, eccentrics, etc. The speed of each stoker grate is independently controlled by an adjustable ratchet device, and its rate of travel is regulated, as frequently as

circumstances require, in order to maintain steam at the proper pressure. Coal is fed into hoppers, at the front of the boilers, the thickness of the fire being governed by an adjustable plate extending across the width of the grate. The speed of the grate should be such that the coal, in passing from front to back, is entirely consumed. Ashes and clinkers are dumped and removed at the back of the boilers.

It may not be out of place to note here that the stokers worked perfectly during the entire trip, and so easily was the regulation of the coal supplied the furnaces controlled, that fluctuations in steam pressure were but slight indeed. No smoke issued from the smoke pipe at any time.

Where, as is the case on the Wallace, the steam supply demanded, and, consequently, the speed developed, is fixed, and only changeable within narrow limits, there can be no question as to the decided superiority of stokers

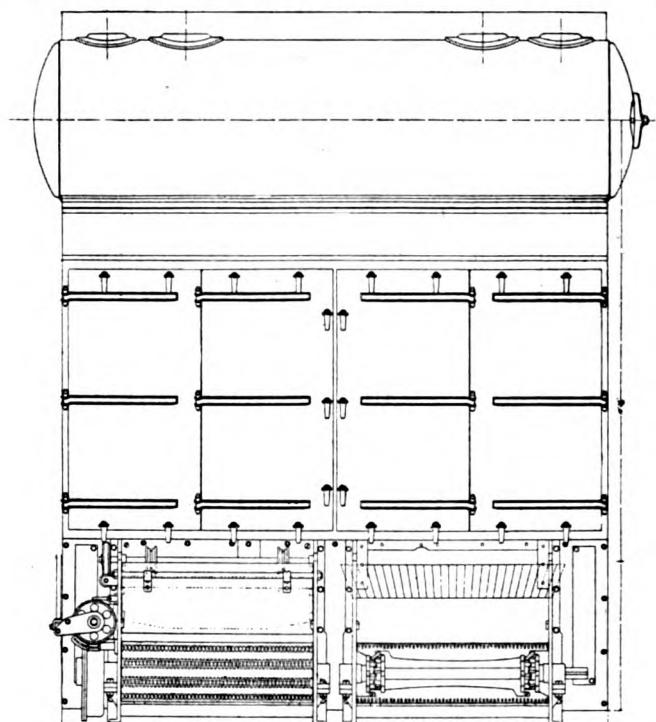


PLATE II. BABCOCK & WILCOX BOILERS ON THE STEAMER JAMES C. WALLACE.

over hand firing from every standpoint. Moreover, practical experience with stokers fitted to boilers of lake steamers during the past few years has resulted in improving the mechanical construction to such an extent that breakdowns are rare, and when they do occur, are usually readily and quickly remedied. In view of this success, the advisability of equipping at least one-half the boiler plant of men-of-war with stokers is worthy of serious consideration; flexibility could be provided for by hand firing on the remaining boilers.

Three samples have been examined, and the heat value in British thermal units (by Mahler bomb calorimeter) per pound of dry coal, and proximate analyses are recorded below:

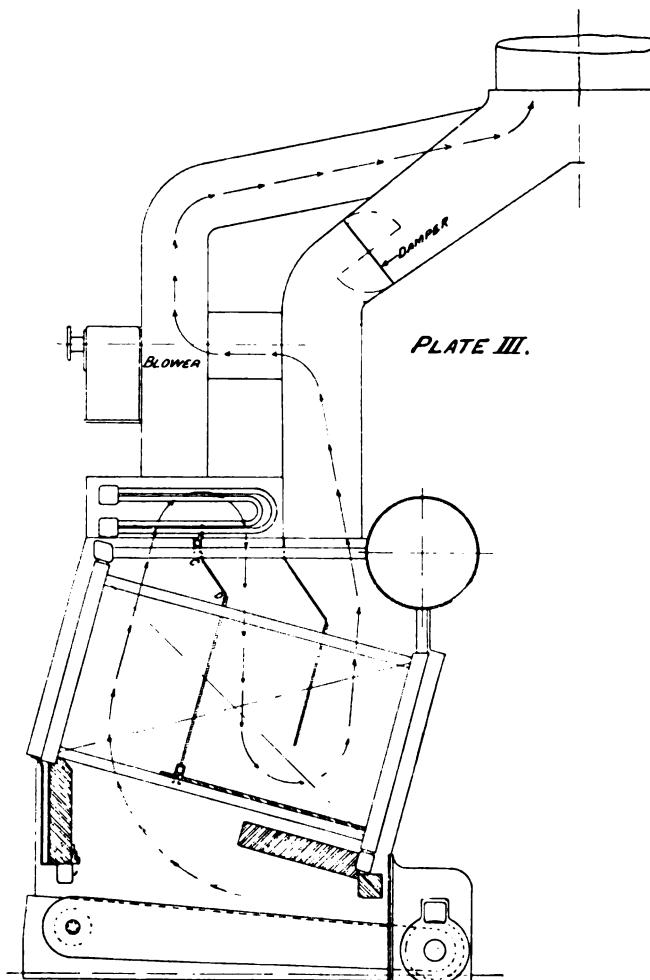
PERCENTAGES OF DRY COAL.

	B. T. U.	Volatile Matter.	Fixed Carbon.	Ash.
Sample No. 1.....	13,466	29.23	59.53	11.23
Sample No. 2.....	13,499	28.37	57.51	14.42
Sample No. 3.....	13,593	28.60	60.63	10.77
Average	13,519	28.73	59.22	12.14

The coal used during the entire trip was western Pennsylvania bituminous slack, loaded at Ashtabula. On each

test an average sample was secured and sealed in a jar for determination, at a convenient time, of moisture, heat value, etc.

For comparison, two tests (Tables I and II) were made with the superheater in operation, and two (Tables III and IV) with saturated steam, the superheater being entirely blocked off and cut out. During all tests, the coal was carefully weighed, the main engine indicated, and the important engine and fire-room data recorded half hourly. The water evaporated was not weighed as the facilities for doing so were lacking. This is to be regretted, since



INDICATING PATH OF GASES OF COMBUSTION WITH SUPERHEATER IN OPERATION AND USING INDUCED DRAFT.

valuable information regarding steam economy of the main engine under the different conditions was not obtainable.

A blower, having a central inlet and discharging at its periphery, is fitted (see Plates III and IV) at the back and over each boiler, to handle the products of combustion after passing through the boiler. In the ordinary steaming of the ship these blowers are used, as the draft is thus under complete control, and entirely independent of weather conditions. These blowers, however, are not an absolute necessity, and may or may not be used.

Plate III is an outline sketch of the boiler, in which is indicated the path of the products of combustion with the superheater in operation. As shown, a damper is provided in the uptake, which is kept closed or open, depending on whether the blowers are running or stopped. Of the two tests with superheated steam, the first was conducted with the blowers stopped, and the second with blowers (Plate III) running. Both of these tests were made on the up trip of the vessel (Ashtabula, O., to Duluth, Minn.) with no cargo, but with water ballast.

SUMMARY OF TESTS.

	Test I.	Test II.	Test III.	Test IV.
Duration, hours	8	6	8	6
Kind of steam	Super-heated.	Super-heated.	Satuated.	Satuated.
Steam pressures, gauge:				
At boilers	237.6	241.2	237.3	238.7
At first receiver	233.7	240.4	234.6	237.8
At second receiver	94.2	95.4	101.2	90.2
At third receiver	34.1	34.3	38	33.5
Vacuum, inches	9.96	9.74	11.63	10.12
Revolutions per minute.....	24.5	24.9	24.6	24.6
Cut off in cyls., percent of stroke:*				
H. P. cylinder .....	.574	.574	.574	.504
First I. P. cylinder .....	.659	.659	.647	.693
Second I. P. cylinder .....	.598	.598	.606	.64
L. P. cylinder .....	.605	.605	.556	.58
Mean effective pressures:				
H. P. cylinder	90.36	91.2	85.9	82.77
First I. P. cylinder	36.39	35.7	40.87	36.37
Second I. P. cylinder	16.06	16.78	18.44	17.27
L. P. cylinder	6.84	6.98	8.08	7.16
Indicated horsepower:				
H. P. cylinder	389.7	397.1	377.8	348.6
First I. P. cylinder	381.9	377.5	437.3	371.1
Second I. P. cylinder	396.7	413.1	461.6	412.5
L. P. cylinder	390.9	401.9	463.8	398.3
Total	1,559.2	1,589.6	1,740.5	1,530.5
Coal:				
Moisture in percent.....	3.38	2.89	3.07	2.88
Per hr., as fired, pounds	2,362.5	2,616.7	3,137.5	2,700
Per hr., per I. H. P. (moist), pounds	1.515	1.646	1.803	1.764
Per hr., per I. H. P. (dry), pounds	1.464	1.598	1.747	1.713
Per hr., per sq. ft. grate (moist), pounds	15.96	17.68	21.2	18.24
Percent of ashes in coal...	19.87	15.32	17.8	14.4
Kind of draft.....	Natural.	Induced.	Natural.	Natural.
Draft (ins. water), base of smokepipe .....	.22	.42	.24	.22
Temp. at base of smokepipe, deg. F.	485.3	499.6	557.1	553.5

*As determined from indicator cards.

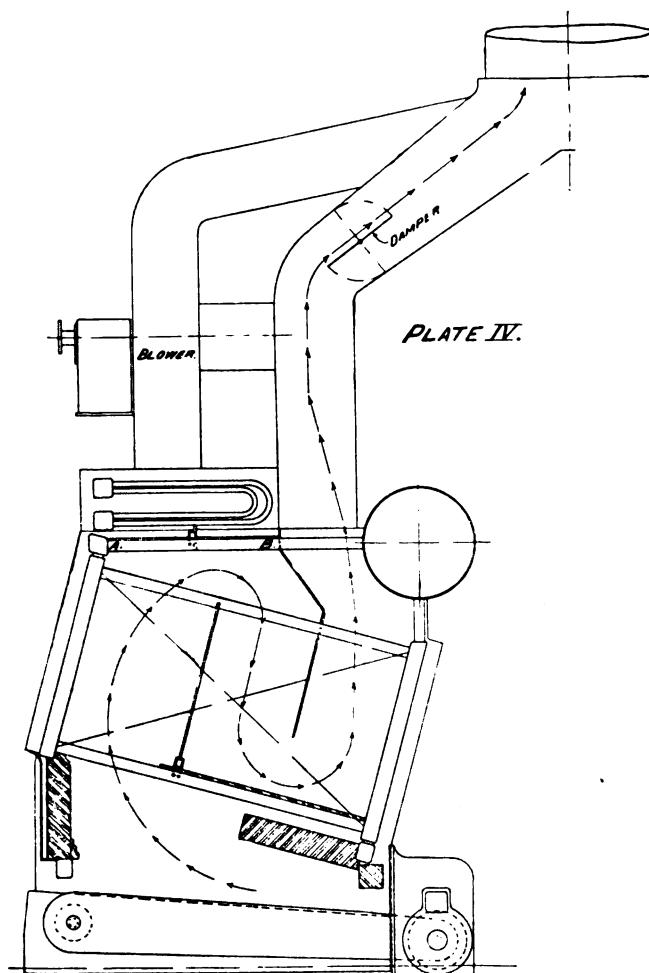
†At 11.02 a. m. cut offs changed at follows: First I. P., .705; second I. P., .671; L. P., .575.

At Duluth, while loading with iron ore, the baffle marked C-D (Plate III) was removed from both boilers, and an additional fire-brick baffle laid on the upper row of 4-in. tubes, as shown on A-B (Plate IV). Under the changed conditions, it will be noted (Plate IV) that the products of combustion no longer circulated around the superheater tubes. By opening the communicating valves between drums and main steam line, and closing the valves to the superheater, saturated steam is thus sent to the engine. Tests III and IV were made under these conditions on the down-trip of the vessel.

With the superheaters in use, the temperature of the steam was taken just after leaving each boiler, and again near the throttle of the engine. These temperatures will be found recorded in the tables. The results of Test I show an average superheat at the boilers of 86.9 degrees and at the engine of 81.7 degrees. These figures, for Test II, become respectively 92.1 and 88 degrees.

To determine the moisture, during the tests with saturated steam, a Barrus throttling calorimeter, attached to the main steam pipe near the H. P. cylinder, was used. The results indicated that the steam was practically dry.

Comparing the results obtained with superheated steam (Tests I and II), it will be seen that the power developed by the main engine differs only slightly in the two tests. The cut-off in each cylinder was precisely the same in both tests, and the only variation in the auxiliaries run worthy of note was the addition, in Test II, of two fire-room blowers and two small cooling pumps. On the basis of dry coal, the saving in fuel amounts to about 8.4 percent in favor of Test I. This difference is scarcely attributable alone to the steam consumption of the additional auxiliaries in Test II, and the result very likely was largely influenced by furnace conditions. The inference, in any event, is plain, viz: that for moderate rates of coal



INDICATING PATH OF GASES OF COMBUSTION WITH SUPER-HEATER CUT OUT AND BLOWERS STOPPED.

consumption with the boiler installation on the Wallace, natural is more economical than induced draft.

In the first three tests the H. P. cut-off was set at the same point. This resulted in Test III (saturated steam), in the development of considerably more power as compared with I and II. In order to approximate to the power shown by the latter, it was necessary to shorten the cut-off of the H. P. cylinder, which was done in Test IV.

By reference to Tests I and IV, it will be seen (excluding cylinder cut-offs) that these were made under like conditions, as nearly as possible, with the exception that in the first, superheated, and in the second, saturated, steam was used. A comparison, based on dry coal, shows a net saving in fuel, with superheated steam, amounting to 14.5 percent. In considering this result it should be remembered that it represents the combined increased efficiency of machinery plant, the most important factor in which is the improved economy of the engine when running under superheated-steam conditions.

CHICAGO GRAIN REPORT

Chicago, Oct. 3.—Grain freights are ruling steady on the basis of 1½ cents to 1¾ cents Lake Erie and Bay corn and nominally 4¼ cents through to Montreal. Very little activity is being displayed on either side since the last report, but the short movement of coal toward Chicago coupled with active call at Lake Superior ports results in but a moderate demand on part of carriers. The total weekly movement of some 135,000 bbls. flour via lake during the past week reflects the active engage-

ments of line steamers in package freight hauling for the balance of the season. With the movement of new grain in near prospect this market will undoubtedly work on a parity with other grain quarters. This will be necessary in order to attract any regulation supply of vessels so that generally a busy fall season is assured in down-bound handling.

The past week's shipping was distributed about as follows: Via all-rail lines of flour, 74,886 bbls.; wheat, 108,185 bu.; corn, 372,608 bu., and oats, 1,402,789 bu. Via lake to Buffalo and other American points of flour, 132,000 bbls.; wheat, 182,000 bu.; corn, 1,961,800 bu.; and oats, 185,000 bu. And via lake to Canada points of flour, 2,171 bbls. and corn, 183,950 bu.

Lake and Rail Shipments:

	This week.	Last week.	Same week last year.
Wheat	290,185	229,175	576,116
Corn	2,644,778	2,941,929	2,311,560
Oats	1,713,980	1,602,603	774,251
Rye	13,533	9,505	37,603
Barley	177,210	89,822	111,934
	4,839,686	4,873,034	3,811,464
Flour	210,018 (bbls.)	169,564	126,445

	Since Jan. 1, 1905.	Same time last year.
Wheat	10,180,219	11,506,924
Corn	74,722,608	57,746,839
Oats	41,974,724	34,554,143
Rye	774,007	943,883
Barley	3,093,786	3,160,432
	130,745,944	107,912,221

Flour	4,780,873 (bbls.)	5,546,451
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Stocks in Private and Public Elevators:

	This week.	Last week.	Same week last year.
Wheat	5,606,000	5,577,000	4,779,000
Corn	3,671,000	4,530,000	5,324,000
Oats	10,304,000	9,721,000	10,616,000
Rye	393,000	182,000	744,000
Barley	177,714	120,714	101,000
	20,151,714	20,136,714	21,624,000

OBITUARY

Capt. Daniel Graham of Alameda, Cal., one of the best known shipping men on the Pacific coast, died suddenly on Sept. 18 at Portland, Ore. He was 69 years of age and a native of Scotland, and since his retirement about twelve years ago, lived in Alameda. He left a widow but no children.

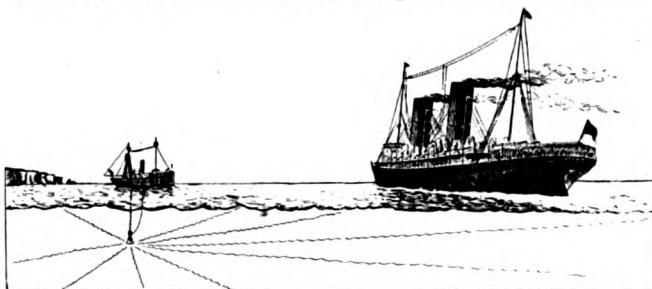
Capt. Christopher F. Moore died at his home, 62 Abbott street, Detroit, last week. He was in his eightieth year, having been born at Harrison, Mich., Jan. 26, 1826. He had followed the lakes since boyhood. During the greater part of his life he was identified with the towing business in the Detroit river, but latterly had turned his attention to passenger craft. His last vessel was the steamer Idlewild. He retired from the business of sailing in 1892.

George W. Pfahl, of Buffalo, has purchased the wreck of the burned barge Roby now lying at the Lime Kiln crossing. Capt. Harris W. Baker will raise the hull and deliver it to Detroit.

The new steamer Peter White has made one round trip and has proved herself to be an excellent vessel. She averaged a speed of 12½ miles with a load of 8,830 gross tons of ore.

CUNARD LINE AND SUBMARINE SIGNALING

Everybody is aware that the waves of light and the waves of sound travel at very different speeds. The flash of a gun is seen before the report is heard, just as the lightning is observed before the sound waves it creates reach the ear of the observer and produce the sound sen-



CUNARDER PASSING LIGHTSHIP FURNISHED WITH SUBMARINE SIGNAL.

sation known as thunder. Both sound and light waves may be quenched by certain adverse conditions of atmosphere, as, for example, during fog, heavy rain, squalls or snowstorms. In such cases a ship can derive no assistance from signal lights, while such are the vagaries attaching to the transmission of sound that even if the gun, the explosive rocket, the fog bell, or the steam whistle is heard, it is frequently impossible to locate with any-

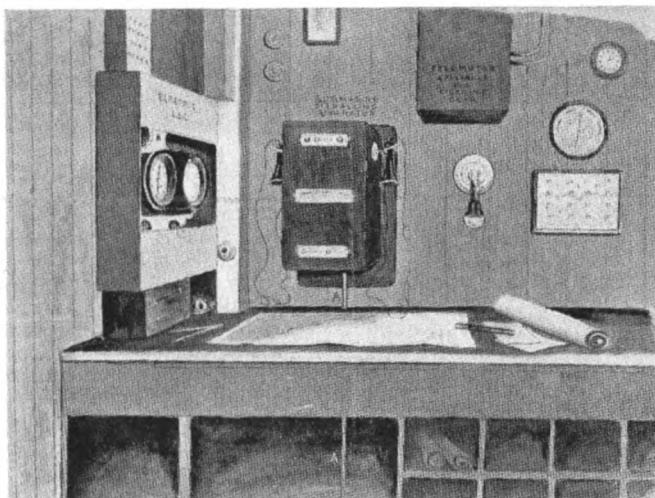
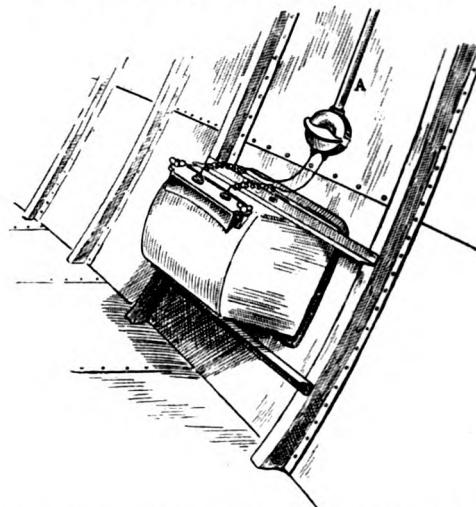


CHART ROOM ON THE NAVIGATING BRIDGE OF LUCANIA. THE TUBE MARKED "A" CONTAINS THE TELEPHONE WIRES WHICH LEAD TO THE ELECTRIC TRANSMITTERS ON EACH SIDE OF THE SHIP.

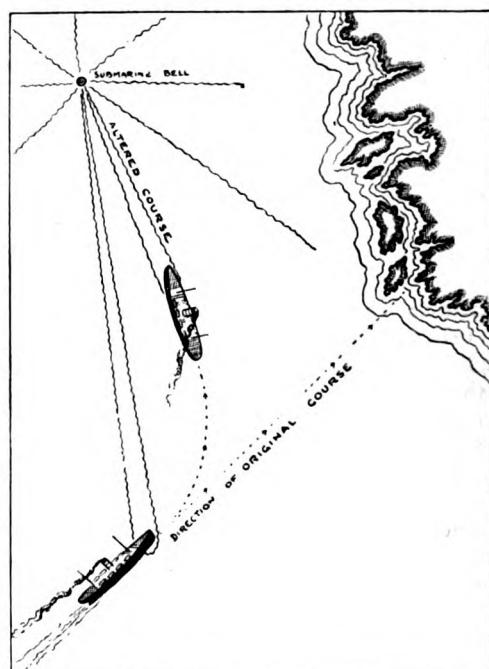
thing like accuracy the distance or position of the sound source. But it is under such conditions as these that signals are most necessary. Take, for example, the case of a steamer approaching the land in thick weather; the rays from the friendly lighthouse or lightship are quenched and the fog signals are admittedly unreliable. Any system of signaling therefore which can be relied upon to assist the navigator is indeed a boon and a blessing, relieving him of anxiety as to his position, and sparing the passenger the unpleasant experiences attaching to being "fog bound." We have already stated that fog, snow, or heavy rain squalls interfere with the passage through the atmosphere of both light and sound waves. Those who have sought to solve the problem of efficiently signaling under such adverse conditions, have therefore directed their attention to another medium through which to despatch sound messages. Sound waves propagated in water travel more rapidly than through air, the respective rates being 4,700 ft. against 1,100 ft. per

second. But the great advantage of utilizing water as a medium for transmitting sound signals lies in the fact



ELECTRIC TRANSMITTERS. THROUGH THE TUBE "A" PASSES ONE OF THE TELEPHONE WIRES TO CHART ROOM.

that sound waves travel through it regularly just as the undulations started on a pond by throwing a stone into it travel in concentric circles from the source of disturbance. What is necessary, therefore, is a submarine sounding body which can give out certain prearranged signals when a visually and acoustically opaque atmosphere renders ordinary light and sound signals of no use. The Submarine Signal Co. of Boston have devised an ingenious system of signaling through water which practical tests on board the Cunard steamer Lucania show to be both reliable and efficacious. The illustrations show the outward and visible part of the signaling equipment in the navigating chart room on the bridge of the Lucania.



THE VESSEL SHOWN IN THE DIAGRAM IS APPROACHING A DANGEROUS COAST IN THICK WEATHER. HEARING THE SUBMARINE SIGNAL SHE IS AT ONCE PUT ON A SAFE COURSE.

There is the telephone receiver box with two receivers, and through the tube marked A there pass two wires, one of which leads to the port side of the ship and the other to the starboard side, below the water line, where at-

tached to the sides of the ship are the patent electric transmitters, connected by these wires with the telephone in the navigating chart room. Such is the apparatus, and the vessel fitted with it can pick up submarine signals as ordinary messages are received by telephone. There must, of course, be the submerged sounding body to set in motion the sound waves which are to excite the electric transmitter. This is a bell which in the case of the waterway leading to New York is attached, as our illustration shows, to the lightship. Electricity is the means employed for striking this bell. Each lightship has a special number which in the case of the Nantucket is six, six, i. e., 66. Now, let us suppose that while making the American coast the weather came on thick, and ordinary signals failed. The submarine bell would be sounded and the sound waves therefrom would travel outwards in concentric spheres to the hull of any steamer which happened to be in the vicinity. If such a vessel were fitted with the signaling apparatus the strokes made on the bell would be distinctly heard by the officer applying his ear to the telephone receiver and he by comparing the intensity of the sounds, heard from each side of the ship, would be immediately informed as to the direction of the lightship. Further, the intensity of the sound would afford a fairly accurate indication of the distance of the lightship. The diagram we produce from a circular issued by the Cunard company shows a steamer standing into danger but diverted into a safe course on hearing the signals from the submarine bell of a lightship, such light vessel being of course in thick weather invisible to shipping even in the immediate vicinity.

This system of signalling has also been applied to the Cunarder Ivernia and will in due course be fitted on other vessels of the Cunard Steamship Co.

LIVERPOOL SHIPPING LETTER

Liverpool, Sept. 25.—The new steamer Amerika, built by Messrs. Harland & Wolff, Belfast, for the Hamburg-American line, left Belfast on Thursday, Sept. 14, for Hamburg, the port of her registry. The ship has a gross tonnage of 22,724 tons, and a displacement of between 40,000 and 50,000 tons at load draught. The first class dining saloon is situated on the main deck, and seats nearly 400 persons. The ship besides is fitted with passenger lifts running to the first class saloon, these lifts being driven electrically. The principal feature in the ship is the Ritz-Carlton restaurant, on the upper promenade deck, with seating accommodation for about 125. The tables are arranged to hold from two to twelve each, and the style of decoration is entirely French, a considerable amount of bronze being used. The first class drawing room for ladies and gentlemen is situated on the upper promenade deck with spacious writing room accommodation. The second class drawing room for ladies and gentlemen is situated on the upper deck with spacious writing room adjacent. A specialty in the German ship is the gymnasium, which is situated at the after end of the ship, and is fitted up with complete outfit of Zander apparatus, consisting of twelve machines, seven of which are electrically driven.

The vessel also carries a massage attendant, who has charge of the electric light bath, which is situated in a special room on the upper deck, where thirty amperes of electric current act in the form of light on the bather's skin. On the upper deck there is a bookstall, and also a florist's shop.

The Marconi house is built of specially large size on the boat deck, with accommodation for two operators, and it will have been observed that between the main

and mizzen masts a double Marconi apparatus is arranged. In addition to this the ship has been fitted with a submarine signal apparatus, which allows communication through the water at a distance of seven miles, whereby in fog the ship can be signaled from lighthouses or dangerous points on the coast. The ventilation of the ship is both natural and mechanical, and a large number of electric fans are introduced through the entire vessel. The imperial suite rooms situated on the lower promenade deck are of the most elaborate description, and aft of these in the same deckhouse, on either side, are arranged the "court" suites or cabins de luxe. The ship is fitted throughout with telephones, and in many of the principal state rooms on the upper and promenade decks the passengers will be able to communicate with the stewards, the inquiry office, purser, doctor, etc., without leaving their rooms.

The arrangements for second-class passengers have also been admirably thought out, and a very fine saloon, also ladies' room and smoking room, have been provided for their comfort.

Lloyds return of the losses of steam and sailing vessels during the quarter ending March 31, 1905, shows that out of a total of 94 steamers, aggregating 125,000 tons gross, thus removed, British ships numbered 37, totaling 49,539 tons, this being equal to 0.48 percent of the vessels owned. Twenty-two of these were "wrecked," six were lost by collision, one foundered, and eight were posted "missing."

Germany lost seven steamers of 19,024 tons, which was 0.47 percent of the vessels owned and 0.66 percent of the tonnage owned. The United States lost but two steamers of 3,306 tons, being 0.23 percent of the total owned and 0.25 percent of the steam tonnage. In sail the United Kingdom lost thirteen vessels, totaling 11,990 tons, being 0.85 percent of the number and 0.86 percent of the sailing tonnage owned.

The United States lost twenty sailing vessels, totaling 8,953 tons, being 0.96 percent of the number and 0.70 percent of the tonnage owned.

The total of steam and sailing vessels lost during the quarter under review was 197 vessels, aggregating 188,640 tons. Of these Britain lost fifty of 61,529, the ratios being 0.54 percent to the total number owned and 0.40 percent of the tonnage. Germany comes next with twenty-two vessels and 16,642 tons, the ratios being 1.78 percent and 1.40 percent respectively. America lost a total of twenty-two vessels of 12,259 tons, being 0.74 percent of the number and 0.47 percent of the tonnage owned. Of the total vessels lost, twelve were abandoned, seven condemned, six burnt, thirteen by collision, twelve foundered, two "lost," etc., twenty-nine missing, and 116 wrecked.

The battleship Indiana which has been undergoing repairs at the New York navy yard during the past two years, will be ready to go into commission next January. She will take the place of the battleship Massachusetts in the fleet. The Massachusetts will go to the New York navy yard to have her boilers repaired.

Moran Bros. Co., Seattle, Wash., have practically secured the order to rebuild the British ship Lord Wolsey which was dismantled in a gale off Cape Flattery about a year ago and towed into Victoria. When rebuilt she will be named Everett G. Griggs, after the superintendent of the St. Paul & Tacoma Lumber Co.

The R. M. Spedden Ship Building Co., Baltimore, Md., has laid the keel for a tug to be 108 ft. long.



DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED
OR ASSOCIATED WITH MARINE MATTERS
ON THE FACE OF THE EARTH.

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OCTOBER 5, 1905.

Orders for 100,000 tons of shipping were placed with Clyde ship builders during September, while 40,000 tons of new ships were launched during that month. This boom in ship building is due to the expectation of a great increase in trade with the far east, now that the war between Japan and Russia is over. No one hears, however, of any orders being placed in American coast shipyards for vessels for the foreign trade. It would be refreshing to hear that such an order had been placed, for it would break a dismal monotony that has now lasted for more than four years. It is past four years since an order was given to an American ship builder for the construction of a ship for foreign service. What possible pride the country can derive from this is beyond all understanding. It is a crying shame that one of the most magnificent industries of the world should be permitted to languish in a country that is unrivalled as a producing nation, a country which has grown great through the ramifications of its industries. It should be said over and over again that no single order is as important to general industry as the placing of an order for a ship. It quickens the pulse of an hundred arts. It employs thousands from the commonest laborer to the highest priced artisan. It puts money into immediate

circulation, since 90 percent of the cost of a ship is the labor of building it. The fiscal policy of the government has made it impossible to operate ships on the high seas at a profit. Why not remedy the situation by legislation? It can readily be done by passing the bill which was introduced into congress by the Merchant Marine Commission.

The question of an adequate engineering force for vessels of the United States navy has been brought acutely before the country again by the disastrous boiler explosion on the gunboat Bennington, in which hundreds of lives were lost. Great difficulty is being experienced in getting men to man the naval vessels. It is difficult to get men for vessels actually in commission and as far as the ships now building are concerned, it is a serious problem to obtain an adequate and competent force. When this is true of the line, how much more must it be true of the engineering department. The root of the trouble lies deep. Under existing conditions the possible available supply of men for the navy is an extremely limited one. It must be so since there is no adequate source from which they may be drafted. The cradle of every navy should be the merchant marine. The United States has no merchant marine worth talking about. The real way to get an abundant and competent personnel for the navy is to make the merchant service attractive to American citizens. A man cannot step from the sidewalk to a ship and be expected to perform competent service; nor can he go from Annapolis to the engine room and be trusted with the responsibility devolving upon the operations of machinery of a modern battleship. There is no doubt whatever but that the navy department is in a bad way regarding its engine room force. To the ordinary lad who goes to Annapolis life in the engine room is not especially attractive. He would prefer to be on deck and it is natural that he should since the navy department itself has always emphasized the superiority of the line. This, of course, is a survival of the time when ships were operated exclusively by sails. The engine room has had to fight its way to equal recognition since steam became the accepted method for the propulsion of ships. Equal recognition is not even yet accorded, though one competent authority considers that the difference is largely a matter of clothes. Apart, however, from the greasy suit of overalls and the coat of gold lace, the fact remains that the engine room force has been looked down upon by line officers. Any distinction between the two divisions should be abolished by departmental orders.

The suggestion has been made that the door be opened for the entrance of civil officers into the engine room. It is a good one. Assuredly the graduate from the leading technical schools is quite as competent as the graduate from Annapolis but the young graduate from Cornell is no more competent to go immediately into the engine room than the one from

Annapolis. What is wanted is preliminary service on board ship. The most sensible way to provide an abundant supply of men for our future battleships is to build up an American merchant marine from which they may be drafted as they are needed.

ANNUAL MEETING AMERICAN SHIP BUILDING CO.

The annual meeting of the American Ship Building Co. at Jersey City, N. J., on Wednesday of this week was without special incident. The expected opposition of the common stockholders did not materialize. The following directors were elected: Wm. L. Brown, H. H. Porter Jr., James C. Wallace, Robert Wallace, Robert L. Ireland, Russel C. Wetmore, H. M. Hanna, Edward Smith, Andrew M. Joys, L. M. Bowers, Alexander McVittie, A. B. Wolvin, Wm. C. McMillan, Frank W. Hart and John A. McGean. Executive committee: Wm. L. Brown, James C. Wallace, R. L. Ireland, R. C. Wetmore, Edward Smith, L. M. Bowers, Alexander McVittie.

Mr. Edward Smith takes the place of the late Luther Allen in the board of directors. Mr. W. L. Brown was chosen as chairman of the board of directors and of the executive committee. At a meeting of the board of directors, the following officers were elected: President, James C. Wallace; vice president and treasurer, Russel C. Wetmore; secretary and assistant treasurer, O. J. Fish; counsel, James J. Hoyt.

The financial statement gives the earnings for the fiscal year ended June 30, 1905, as \$1,549,450.61. The sum of \$640,349.90 was added to surplus, making the total surplus as of June 30, \$4,318,792.65. Following is the financial statement:

RESOURCES.

Plants and property	\$16,397,027 36
Additions and improvements	47,343 54
Material on hand (market value).....	532,829 04
Accounts and bills receivable.....	2,708,600 06
Due on construction contracts.....	1,400,028 75
Cash	656,994 30
	<hr/>
	\$21,742,823 05

LIABILITIES.

Capital stock, preferred	\$7,900,000 00
Capital stock, common	7,600,000 00
Accounts and bills payable.....	1,617,698 81
Reserve for maintenance	200,000 00
Reserve for fire insurance.....	106,331 59

Earnings

Less:

Dividends, preferred	\$553,000 00
Depreciation	315,408 85
Rebuilding	40,691 86
	<hr/>
	\$909,100 71

Balance

Balance June 30, 1904.....

Working capital June 30, 1905.....

\$21,742,823 05

President Wallace says in his report:

"It seems to be thoroughly demonstrated in the minds of nearly all vessel owners that the larger size vessels and type of construction now being built is inevitable and that a large number of the old vessels will gradually be remodeled. Necessarily, however, to provide for the larger construction, enlargement of drydocks and additional modern machinery is essential and must be provided to keep the company's plants up to the highest efficiency."

FREIGHT SITUATION

Were it not for the fact that the ore movement is so thoroughly covered by contract, it is likely that the wild rate would advance under the stimulus given to the market by the great demand for grain tonnage. As usual the Steel Corporation is the dominant factor. A couple of weeks ago it was inclined to be lenient with its contract tonnage, but now it insists upon the delivery of ore under contract. Certain vessels that have sought the grain trade have been withdrawn to care for ore. The result is that grain shippers are looking for tonnage, and as usual, when there is greater demand than supply, the grain rate has been continually advancing. Indications point to an extremely heavy grain movement at attractive figures to vessel owners, and as stated, were it not for the grip that contract tonnage has on the ore trade, the wild ore rate would surely advance.

Ore figures for September were 4,287,387 tons, showing a slight gain over the figures of the same month last year which were 4,006,442 tons. If the ore movement for October and November equals that of last year, the total movement for this year will reach 33,000,000 tons. There is ample tonnage to care for this movement, of course, but it is doubtful if Lake Erie docks are in shape for it. Dispatch has been very poor lately, certain vessels being in port over a week waiting to be unloaded. This condition has been brought about by the diversion of cars by railways to other trades with the result that there is great scarcity of ore cars. Improvement in this particular is much desired, but there is little expectation of it.

Wages were generally advanced on Oct. 1 by an agreement made with the Lake Carriers' Association last January. Wheelmen, watchmen and lookouts have been advanced from \$45 to \$65 per month; ordinary seamen from \$27.50 to \$37.50; able-bodied seamen from \$45 to \$65; second cooks from \$30 to \$37.50; porters from \$25 to \$35, and firemen, oilers and watertenders from \$45 to \$65.

NEW ORE DOCK AT MARQUETTE

Duluth, Minn., Oct. 3.—Plans for the new ore dock of the Duluth, South Shore & Atlantic road, which is to be built at Marquette this winter, have been completed. The dock is to be 70.66 ft. high from water to deck and will be 1,200 ft. long, pocket length, with approaches of 150 ft. more. There will be 50,000 tons storage capacity and the cost will be \$400,000. M. J. Peppard & Co., who have done much South Shore work, have the contract and the dock is to be ready for the opening of navigation. The shore approach will be of concrete piers and plate girder bridges over streets and buildings to the shore line. The dock will be on the site of old No. 3, which was abandoned fifteen years ago and was long ago torn down. The South Shore's present ore docks are in bad shape, and large vessels have for some time been unable to load there. This is the first of three, perhaps four, large ore docks to be built at upper lake ports the coming winter.

The Ohio Valley Improvement Association will meet at Cairo, Nov. 15, 16 and 17 to discuss the improvement of inland navigation.

Mr. J. Bruce Ismay, president of the International Mercantile Marine Co., arrived in New York from Liverpool last week.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., is to make extensive repairs to their pier No. 1.

A TRIP UP THE LAKES



BOW WAVE OF THE CENTURION.

course, the bulk freight carriers confined to the coal and ore trades have

practically no passenger accommodations, but nearly all of them have from one to four staterooms capable of accommodating from two to eight guests. As a rule these invitations are confined to interests and families directly associated with the trade. They are by no means dealt out promiscuously.

Those that are favored with an invitation, however, really have a most delightful time.

To the uninitiated a vessel confined to the coal or ore trade might seem a dirty and uncomfortable thing for a passenger to travel on; but the reverse is the truth. As soon as the cargo is aboard the steamer is made as trim and neat as a private yacht and the character of the accommodations afforded is such as to justify the term of luxury. Certainly similar accommodations on a passen-

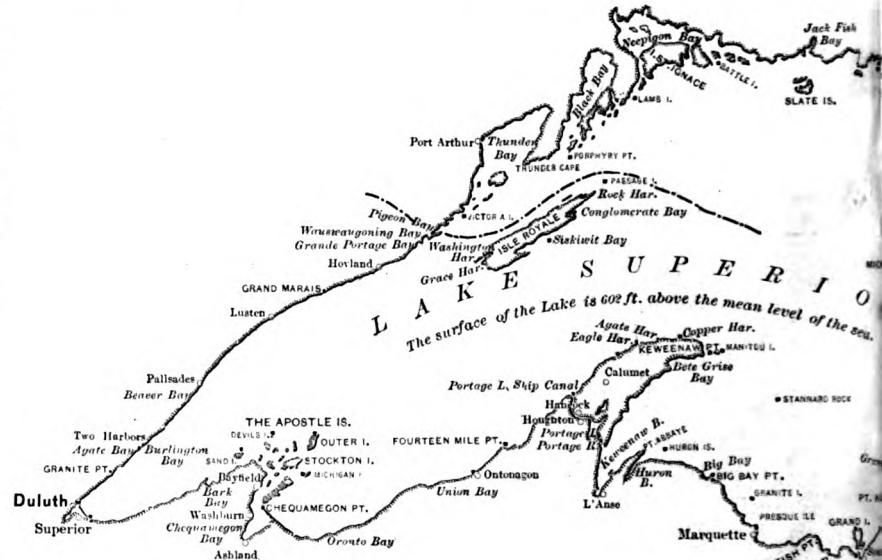


THE CAPTAIN ON THE BRIDGE.



THE NORTH WEST IN ST. MARY'S RIVER.

ger liner would cost a royal price, if indeed they could be said to exist at all. The staterooms on a freight boat are really rooms of ample cubical dimensions, supplied with an abundance of light and in some of the old boats being flush with the deck, ventilation is perfect. In fact similar accommodations on a fast Atlantic line would cost \$1,000 from New York to Liverpool. As the companies on the lakes operating these freighters have grown in wealth, in influence and in ramification of enterprise, such as iron mining and steel making, they have given attention not only to the greater burden of the steamer, but



also to the introduction of a certain elegance into the limited passenger accommodations. There are probably a half dozen steamers on the lakes whose passenger accommodations note a refinement that is scarcely to be found on a private yacht since the line is distinctly drawn between beauty and mere display.

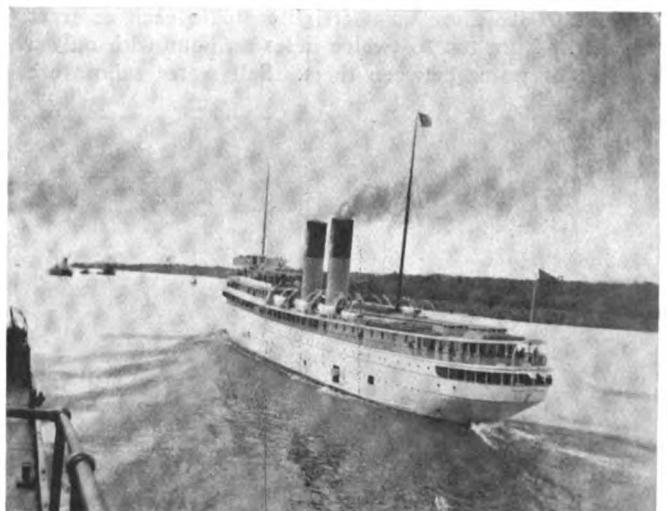
The new steamer Peter White, just built for the Presque Isle Transportation Co., at the yard of the Great Lakes Engineering Works of Detroit, has passenger accommodations of the most exquisite finish, though no special emphasis was intended to be made upon this feature of this particular ship. Nevertheless, the most beautiful woodwork has been introduced in the construction of the staterooms and a number of little conveniences are provided in the way of book racks, individual sideboards for ice water and shaded lights in each stateroom. The steamer Wm. G. Mather now building for the Cleveland Cliffs Iron Co. at this same yard will probably have the most complete passenger accommodations of any freight vessel on the lakes. She will be the flagship of the Cleveland Cliffs fleet. Considerable thought has been devoted to making her a model of comfort, convenience and elegance in the entertainment of the directors, officers and associated interests of this enterprising company.

The accompanying map showing the

various ports on the great lakes also shows the freight routes of these steamers. The great bulk of ore is shipped from Lake Superior ports and taken to Lake Erie docks. The distance from the head of the lakes to Buffalo is 1,000 miles, or to be exact 996 miles, so that a round trip from Buffalo to Duluth or Ashland means a trip of practically 2,000 miles, or two-thirds the distance across the ocean, made under conditions of comfort that cannot possibly obtain on an ocean liner. In the first

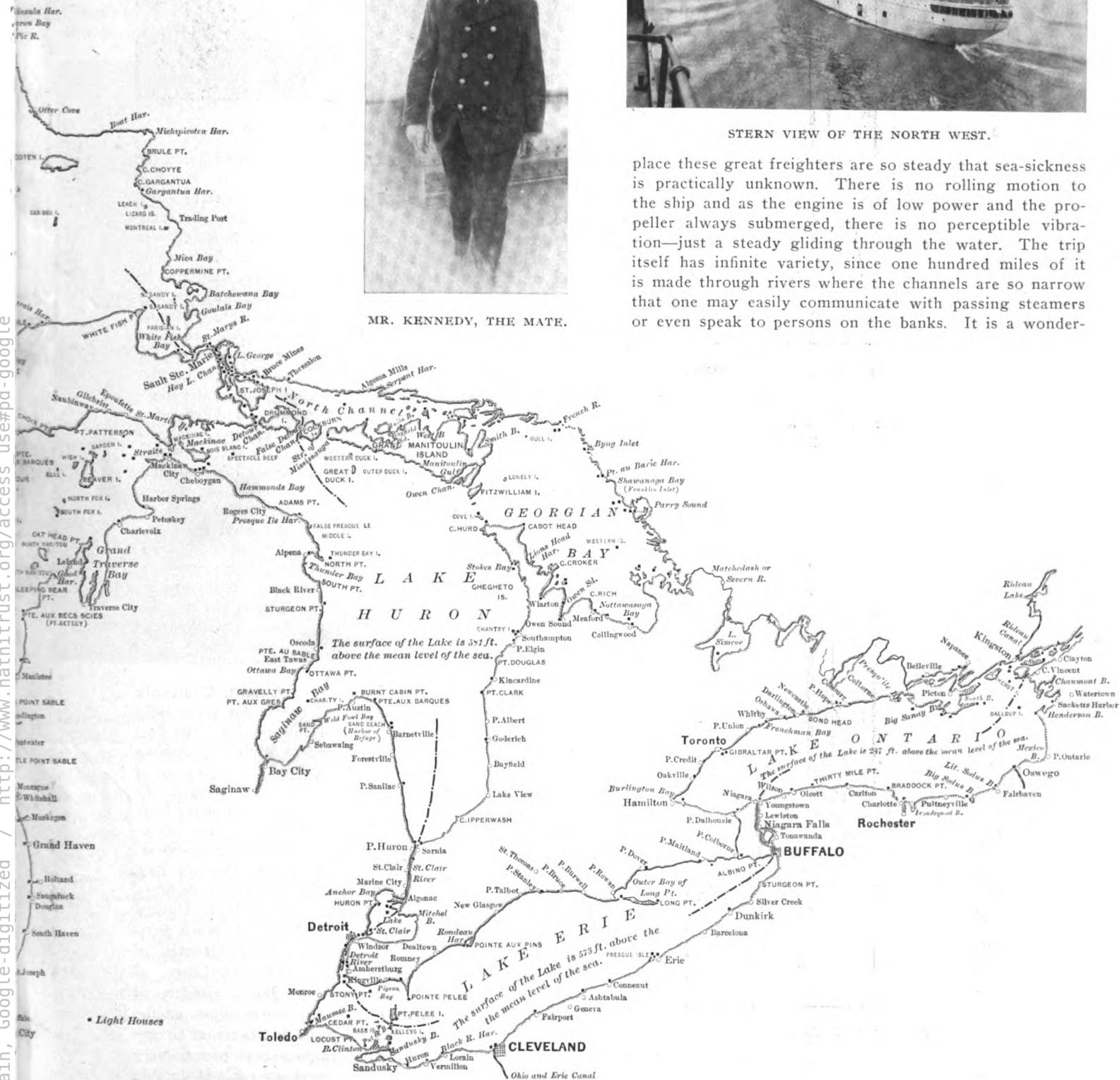


MR. KENNEDY, THE MATE.



STERN VIEW OF THE NORTH WEST.

place these great freighters are so steady that sea-sickness is practically unknown. There is no rolling motion to the ship and as the engine is of low power and the propeller always submerged, there is no perceptible vibration—just a steady gliding through the water. The trip itself has infinite variety, since one hundred miles of it is made through rivers where the channels are so narrow that one may easily communicate with passing steamers or even speak to persons on the banks. It is a wonder-



MAP SHOWING THE PORTS OF THE GREAT LAKES.

ful sight to see these giant freighters pass each other at a speed of from ten to twelve miles an hour with only a few feet of water between them. Salt water sailors are



PASSING AN OLD SCHOONER IN DETROIT RIVER.

apt to scoff at lake seamanship, but that is because they know nothing at all about it. There are scarcely more than twenty vessels on the ocean that are longer than



TWO ORE CARRIERS PASSING EACH OTHER.

ship has plenty of sea room, but a lake master has a lee shore to reckon with at all times.

It is frequently charged that while lake masters are good pilots they are not navigators, and while that may have been true in the past, it is becoming less and less true. This article has to do merely with observations made on a recent trip on the steamer Centurion of the Cleveland Cliffs Iron Co., commanded by Capt. C. E. Sayre. Capt. C. E. Sayre is a navigator in the strict sense of the word, if an acquaintanceship with the compass and its compensation, the pelorus or dumb compass for taking bearings, azimuth and tables, deviation tables, laying off courses and bearings on the chart, finding the ship's position in fog, snow, mist or thick weather, and an understanding of the laws of magnetism and the relation of the compass to the earth's and ship's magnetism may be said to embrace the art of navigation. These are things of course that every master ought to know, but it is probably true that some masters have got along for a great many years without knowing all of them. Owners and masters, however, are giving more thought to the scientific operation of the ship, to the compass and its errors than formerly. The modern steamer indeed represents a considerable investment, approximating with its cargo a half million dollars. This is too valuable a thing to leave to chance if a little knowledge can eliminate the element of chance.



CAPT. C. E. SAYRE.

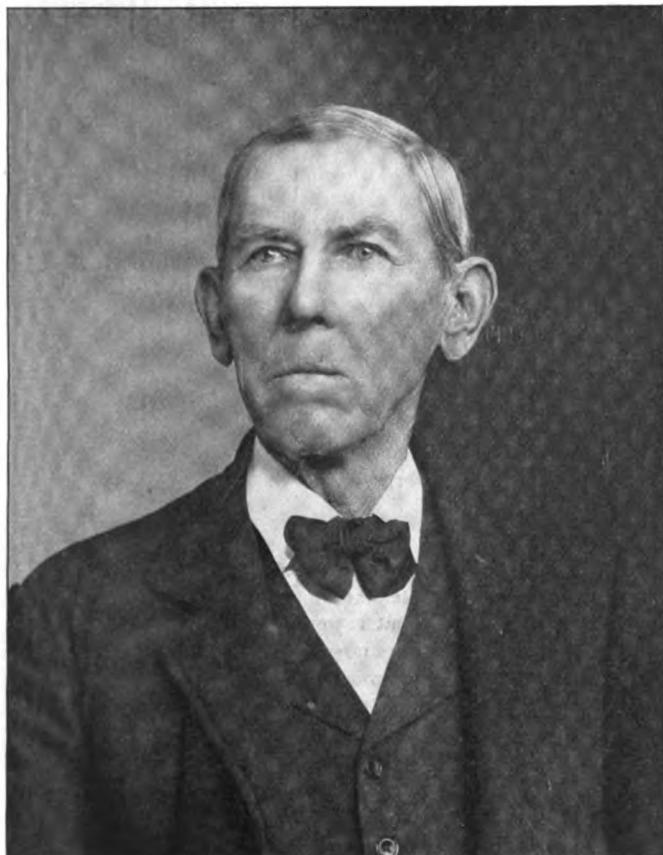
the longest of the modern lake freighters, and it requires great courage and skill to handle them in the restricted channels of the lakes. Moreover, in storms a salt water

The Automatic Machine Co., of Bridgeport, Conn., are at present very busy trying to fill orders for their automatic marine gasoline engines and hoisters. A large fleet of power boats have been at their works fitting out. Among them have been one each from Capt. W. I. Stevens of Rowayton, Conn.; James Brice of Oyster Bay, L. I.; Samuel Thorne of Glenwood, L. I.; and two boats from H. W. Schmeelk & Co. of Canarsie, N. Y. The Automatic Machine Co., have recently installed a 28-horse-power for Messrs. Foreester & Hoag at Prince's Bay, S. I., N. Y.; 30-horse-power for Van der Borgh & Sons of West Sayville, N. Y.; 40-horse-power for H. E. Downs of Greenport, N. Y.; 21-horse-power for E. Brown & Bro. of Bayport, N. Y.; 7-horse-power for Harry Hunter of Norwalk, Conn.; 21-horse-power for Joseph Lowe of Key West, Fla.; 14-horse-power for James Golden of Norwalk, Conn.; and they have a 40-horse-power engine testing which goes to Lowndes, Mills & Ockers at Greenport, N. Y. The "Automatic" engines have proven very popular to those that require a good, strong and durable engine, and one that can be relied upon at all times.

DEATH OF CAPT. JOHN F. DRAVO

In the death of John F. Dravo, which occurred at Beaver, Pa., on Saturday last, Pittsburg lost one of its noted men and inland navigation its dean. Notwithstanding his age, 85 years, Capt. Dravo was actively engaged in business until the present summer. He was a member of the party which accompanied the rivers and harbors committee of the House of Representatives on its trip last spring on the steamer Queen City from Pittsburg to Cincinnati, and his advice upon that occasion was much sought after by the congressional committee.

Capt. Dravo had been actively identified with Pittsburg interests for more than half a century. It was he who years ago with John Reeves, of Beaver Falls, planned the Pittsburg & Lake Erie railroad and finally built it under most



CAPT. JOHN F. DRAVO.

adverse conditions. The first portion of the line was completed between Beaver Falls and Youngstown, and when the first train left the Beaver valley, Capt. Dravo addressed a large crowd from the pilot of the engine. He then bent his efforts to extending the line into Pittsburg, but met with poor success from capital until Andrew Carnegie came to his aid, when the enterprise was successfully completed.

Capt. Dravo was born at West Newton, Pa., Oct. 29, 1819, his parents being Michael and Mary (Fleming) Dravo. Educated in the common schools and at Allegheny College, Meadville, he engaged in teaching and, being gifted with speech, became a local preacher in the Methodist Church, with which he remained identified all his life. He learned the details of the coal business in his father's office, and in 1845 embarked in the coal business for himself. In 1854 he founded the town of Dravosburg, Pa., now a flourishing mining center, and while actively engaged in coal mining, he early saw the possibilities of improved navigation on the Monongahela and Ohio riv-

ers. In 1868 he organized the Pittsburg & Connellsville Gas, Coal & Coke Co., becoming its general manager and treasurer. This company began with 40 ovens, and when Dravo retired from the presidency in 1883, it was operating 400 ovens. In 1876 Capt. Dravo was elected president of the Pittsburg Coal Exchange, which position he held continuously for 10 years. He was active in securing the organization of the Pittsburg Chamber of Commerce, was one of its charter members and for several years its president. It was largely through his efforts that the Government undertook the improvement of the upper Monongahela river, and the location and erection of the Davis Island draw in the Ohio river. He was in the brunt of the fight for free navigation on the lower Monongahela, which was freed by the purchase of the existing locks and dams by the Government. One of his principal fights during recent years has been for the enforcement of the law against low bridges now spanning the streams.

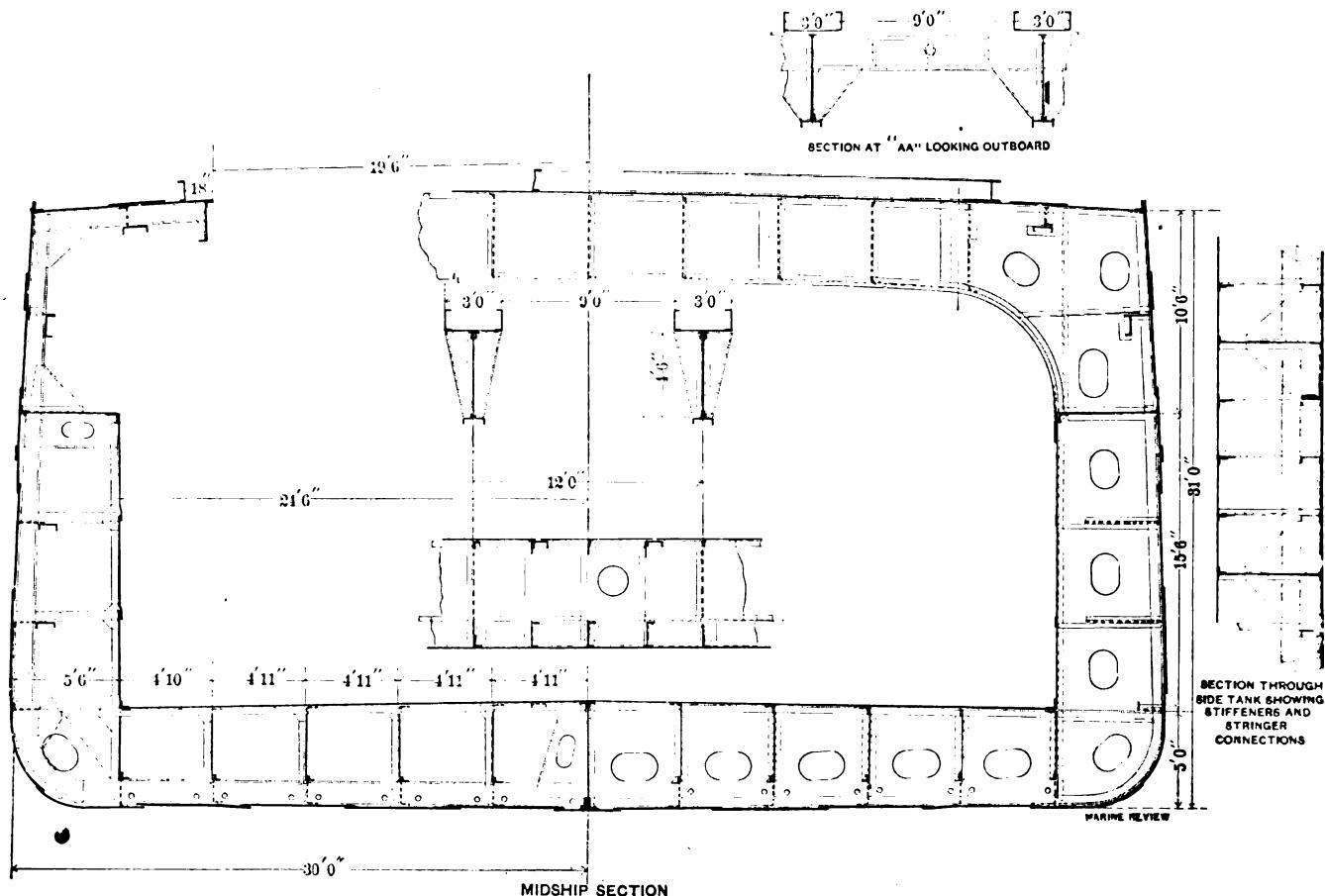
His political career was also remarkable, as he was one of the organizers of the Republican party and a delegate to the convention that nominated Lincoln. He twice held the position of surveyor of Pittsburg, and served two terms in the Pennsylvania Legislature. His only hobby was a flower garden at his beautiful home overlooking the Ohio river at Beaver. He worked in this garden every morning before he went to Pittsburg on business.

AT THE HEAD OF THE LAKES

Duluth, Oct. 3.—G. A. Tomlinson has organized the Franklin Steamship Co. of Duluth. It is to build the ship for Mr. Tomlinson at West Superior that has been ordered from the American Ship Building Co. Material for the ships that the Superior company is to put up this year are arriving and the yard is being fitted up for the work.

Grain rates from Duluth to Buffalo are now $2\frac{1}{4}$ cents and there is considerable activity in the tonnage market. The October business at the head of the lakes is assuming good proportions. September shipments of grain at the head of the lake amounted to 6,844,000 and receipts to 10,785,000. Of this about half was during the closing week. The receipts are increasing rapidly. There were 1,600 cars on track on Monday morning, this week, and bid fair to keep up the capacity of the railroads from this time on.

There is a good deal of complaint about the rates that have been put in force by the Canadian Vessel Owners' Association, which were first made public in the Marine Review two or three weeks ago. It has gone so far that Canadian shipping interests profess that they will appeal to the government to permit the shipment of wheat between Canadian ports, that is, from Fort William and Port Arthur and Georgian bay, on American vessels. This is absurd, and the government would take no notice of such a request. Indeed it would do no good if it did, for the rates that American boats would charge from Canadian Lake Superior ports would hardly be less than the Canadian association is now demanding. The Georgian bay rate is based on that from Duluth to Buffalo, and is about the same for though the distance is somewhat less, the traffic is as costly, for after a cargo is delivered at Georgian bay the ship must make other lower lake ports for a return cargo. The Duluth-Buffalo rate is now $2\frac{1}{4}$ cents and the Canadian rate from Port Arthur to Georgian bay, for first half of October, is only 2 cents. The Canadian grain shippers do not know when they are well off, or they would make no complaint at these rates but would fill up on them.



MIDSHIP SECTION OF THE STEAMER WILLIAM G. MATHER BUILDING AT THE YARD OF THE GREAT LAKES ENGINEERING WORKS, DETROIT.

For description see *Marine Review*, Sept. 28.

IMPORTANT LUMBER DEAL

Duluth, Minn., Oct. 3.—Two very important matters in connection with the head-of-the-lakes lumber trade, and the future shipments of lumber eastward by lake, have been settled this week here. One is the purchase of the large mill of the St. Louis Lumber Co., by the Rainy Lake Co., and the other is the removal of the milling headquarters of the Edward Hines Lumber Co. from Ashland to this city. The Rainy Lake Co. is owner of or controls nearly two thousand million feet of standing pine in the country directly north of Duluth, running from north of the Mesabi range to the international boundary. It has one mill at the interior village of Virginia, on the Mesabi range, and has been figuring on building another there, the two to have an annual capacity of 200,000,000 ft., but has come to no agreement on this point. Recently it leased the Lesure mill at Duluth, and after a week bought it outright. It gave a contract to the St. Louis mill at Duluth for a lot of sawing and has now closed a deal for its purchase also. This will give it capacity in this city for about 120,000,000 ft. a year, and in the first mill at Virginia, which it recently bought, it has 90,000,000 ft. more. There is little prospect now that it will build a second mill there, as it has been talked. The product of all these mills is to go east, and the deals insure the operation of the St. Louis and Lesure mills for a long term of years. Both were sawing on contract and had little more timber of their own left. Both might have otherwise have been wrecked next year.

The removal of the Hines headquarters emphasizes the decline of Ashland as a sawing center. It opens the way for some questioning as to the Hines company's intentions for it has not now in this neighborhood more than two or three years' sawing. There have been some large purchases of timber on the north shore of Lake Superior by the Weyerhaeuser and Wright & Davis interests, and it is now supposed

that the Hines company is interested in these purchases, and that it intends to operate here for this timber. This timber will have to be rafted about 125 miles down the north shore to mills at Duluth, but this is now a very plain proposition, and can be done with a minimum of losses. These two deals add a great many hundred million feet of standing pine to that tributary to this market and sure to be shipped east from here by lake. The head of the lakes as a lumber shipping center is prolonged for ten years at least over what it otherwise might have been.

OVERLOADING VESSELS

Buffalo, Oct. 3.—It has always seemed odd to me that so much has been said and so little done on the vexed subject of overloading lake vessels. Sailors have complained and insurance men have grumbled, but the vessel owners have kept on yielding to the temptation of putting on a little more load than would be safe in a storm and taking their chances, for it is too easy a way to earn a few hundred dollars to be given up unless it is made necessary. Insurance interests have suffered untold losses on this account and it looks as though they were to go on losing, for they have not the independence to come out and adopt a load line for every vessel and refuse to be responsible if it is out of sight when the vessel leaves port.

Still we are hearing in these days of steel bottoms all of the old stories of losses that we used to when the fleet was mostly wood, though the term "floating coffins" is not heard quite as much. Yet it is doubtful if the term should be dropped, especially when certain occurrences not so far distant are recalled. Steel vessels have been going down too readily to be sure that they are not out of that list. It may be possible that lake underwriters look at the blackest side of the case, but they have been hit very hard of late, so that

all idea of making money in the business this season is now said to be out of the question.

Speaking of the storm at the beginning of September, which fairly dismayed the lake interests from all sides, a lake underwriter said last week that he was persuaded that every vessel that was lost then was overloaded. He would not hesitate to charge that the decks of all of them were fairly awash before the storm was at all severe and the moment the waves broke over them they were past hope. Now if this is a fact it can be made so to appear, for there were men on board who knew and some of them—alas not all—would be able to make the inference a matter of statement.

The matter of overloading is also attacked from another

their convictions, so we must look elsewhere for someone to put the matter through.

It is well known that the crews of the vessels do possess just that ability and if they can show it by dictating what coal they will burn and will strike because they have no hair mattresses on their beds, and tie up a loaded steamer, as they did in Buffalo a few seasons ago, all they need to say is that the vessel they are to go out in is dangerously overloaded and the thing is done. They will notify the captain that they will go ashore if he attempts to sail. He may try to coax them to go, but in his heart he agrees with them and he will report to the owner. Now if that owner feels that he is in the right he may make a stand for it, but the chances



THE NEW STEAMER PETER WHITE OF THE PRESQUE ISLE TRANSPORTATION CO.'S FLEET.

[Built by the Great Lakes Engineering Works, Detroit.]

point. The effort to save cost has cut out a great part of the trimming of cargo, so that when a vessel sets out with her ore or coal inside, especially ore, which is so heavy and inert, there is a stack of it at each hatch with a circle of much less load all around it. Anybody who has loaded a canal boat, especially if she is a trifle old, knows that it is a good chance that she will spring a leak at her dock if loaded in that way.

Of course the strain is the same with a stronger vessel, only it does not always show so quickly. In the case of the steel fleet the action attacks the rivets and if they are weakened already or their heads are cut short by outside contact with rock there is chance of their coming in two or the heads pulling through the sockets and the vessel goes down in a gale, or possibly does not wait for one. There are those who say that the ill-fated Canadian steamer Bannockburn must have gone down as a result of such a condition. Certain it must be that she must have been somehow weakened to the last ounce of resistance to have foundered in still weather.

Now as to the remedy. It has been proven these many years that the vessel owner will not do anything about it. He does not really mean to put his crew and his property into jeopardy, but he knows that excess cargo means easy profits and he trusts to luck. The underwriters are not thus situated, but they are found not to possess the courage of

are great that he will look the case over and say that he is not exactly prepared to go on record in such a contention.

It would be very wrong to go fishing about for an excuse to get up a strike, considering the late record of unionism afloat, but here is a state of things that would be greatly to the advantage of all concerned if the men would take a "living" stand on it, even if they had to drop a few that they have upheld so stubbornly of late. If the vessel owners do not believe the foundered craft go down as the result of overloading, as the underwriters charge, they have a defense in showing the draught of those that have been lost lately. Are they prepared to do this?

JOHN CHAMBERLIN.

The four-masted schooner Ruth B. Cobb was launched from the yard of Cobb, Butler & Co., Rockland, Me., last week. The Cobb is 200 ft. over all, 37 ft. beam. The new schooner was christened by Miss Martha B. Cobb, daughter of Governor Wm. T. Cobb.

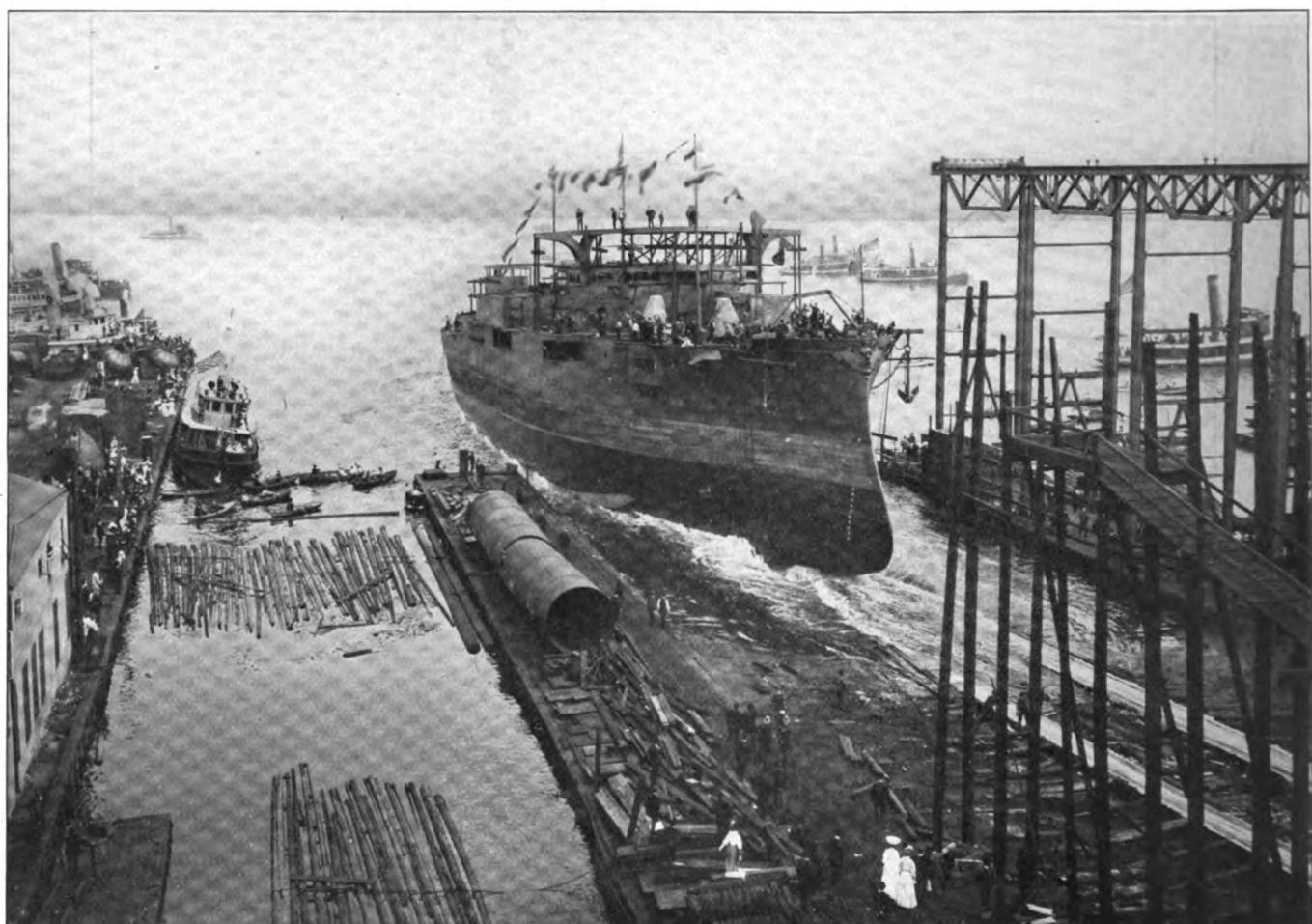
The report of the New York Dock Co. for the fiscal year ended July 31, 1905, shows an increase of \$174,726 in gross and \$105,211 in net earnings, and an increase in the total surplus of \$281,207.

LAUNCH OF BATTLESHIP MISSISSIPPI

In the presence of a distinguished party of guests the battleship Mississippi was launched at 2:53 last Saturday afternoon at the yards of the William Cramp Ship & Engine Building Co., Philadelphia. The vessel's sponsor was Miss Mabel Clare Money, daughter of United States Senator Money. Owing to the prevalence of yellow fever in the South Governor J. K. Vardaman, of Mississippi, and his staff were unable to attend the launching. The governor was represented by Senator Money. The guests included Admiral Dewey, Lieut. Com'dr Wood, Rear Admiral Rodgers, Mayor Weaver of Philadelphia, naval

12-in. breech-loading rifles, mounted in two turrets; eight 8-in. breech-loading rifles, in four turrets; eight 7-in. breech-loaders, behind casement armor, and two 21-in. submerged torpedo tubes. Also these secondary batteries: Twelve 3-in. 6-pounders, two 1-pounder automatics, two 1-pounder rapid-fire guns, two 3-in. field pieces, two machine guns and six automatics.

The Mississippi will be 375 ft. in length on the water-line and the length over all will be 382 ft., with extreme beam of 77 ft. The speed requirement is 17 knots. The ship will be equipped with triple-expansion twin screws of 10,000 I. H. P., fitted with eight Babcock &



LAUNCH OF BATTLESHIP MISSISSIPPI AT CRAMPS.

officers stationed at Philadelphia and in Washington, and many prominent civilians.

The christening party consisted of Senator and Mrs. Money, Miss Money and her fiance, Dr. William Whitney Kitchen. They were escorted to the yard by General George B. Williams, Cramps' Washington representative, who accompanied them to this city. Immediately after the launching luncheon was served in the mold loft.

The Mississippi will carry the smallest displacement of any United States battleship now being built with the exception of the Idaho, a sister ship. The displacement of these two vessels is 13,000 tons each, while all the later battleships, including the Vermont, Kansas and Minnesota, now building in other shipyards, have a displacement of 16,000 tons.

The Mississippi will be equal to many battleships of 16,000 tons displacement, and no vessel of the same displacement in any navy of the nations carries equally heavy batteries. The main batteries will consist of four

Wilcox water-tube boilers, set in water-tight compartments. Except for the windlass and steerage gear, practically all the other machinery will be run by electricity. Wireless telegraphy apparatus will be installed and, in fact, the Mississippi will be so equipped as to equal in every way the highest standard of requirement for modern warships. There will be commodious quarters provided for the crew of 750 officers and men, with special attention paid to sanitary needs.

The steamer Alameda of the Oceanic Steamship Co.'s fleet ran on the rocks at Fort Point on the southern side of the entrance to San Francisco bay while leaving port. The passengers were landed by life boats and tugs.

The navy department has formally accepted the big new floating dry dock built by the Maryland Steel Co. for the Cavite naval station.

AROUND THE GREAT LAKES

Mr. W. H. Hill, assistant general manager of the Great Lakes Towing Co., has resigned.

The Welland canal was lighted by electricity on Friday evening last for the first time in its history.

It is reported that the business of the Richelieu & Ontario Navigation Co., of Montreal, shows an increase of \$250,000 over that of last year.

Work was begun upon the new dry dock at the Lorain yard of the American Ship Building Co. The new dock will be 725 ft. in length and 125 ft. broad.

A revised chart in colors of the St. Lawrence river, No. 2, has just been issued by the United States lake survey office and is for sale by the *Marine Review*.

The tug Winslow owned by the Reid Wrecking Co. was damaged in collision with the steamer W. H. Mack near the mouth of the Detroit river this week.

The Canadian government has decided to keep its entire system of canals, including the locks at the Sault, open on Sundays from Oct. 1 to the close of navigation.

The steamer Delaware building for the Anchor Line at the Ecorse yard of the Great Lakes Engineering Works, Detroit, will be launched on Saturday morning of this week.

The new steamer Peter White ran aground just outside the breakwater at Buffalo with its maiden cargo of iron ore. After lightering about 200 tons the steamer was floated without injury.

The 500-ft. freight steamer building at the yard of the Craig Ship Building Co., Toledo, for Mr. L. S. Sullivan and others, of Toledo, will be named in honor of Eugene Zimmerman, of Cincinnati.

The steamer George H. Russel took out of Chicago last week 235,000 bu. of corn and 58,000 bu. of barley, aggregating 7,972 tons. This is the largest cargo of grain ever shipped from Chicago.

R. C. Brittain, Saugatuck, Mich., a well-known vessel builder and owner, died this week at Chicago following an operation. He was born in Pennsylvania in 1842 and had been engaged in ship building and shipping for over thirty years.

The steamer P. H. Birkhead burned to the water's edge at Alpena, Mich., last week. She was bound for Racine with a cargo of coal and put into Alpena in a disabled condition. The Birkhead was built at Marine City in 1870 and was owned by James O'Connor, Tonawanda, N. Y.

Capt. Mathew R. Ross, of Cleveland, was shot and killed aboard the schooner B. W. Parker in Lake Superior this week. The Parker was in tow of the propeller George F. Williams at the time. The man who did the shooting, a deck hand, was taken to Marquette and turned over to the police.

Col. Charles E. L. B. Davis, United States engineer at Detroit, has notified the Meyers Wrecking Co. that owing to the slow progress being made in the removal of the sunken steamer Linden sunk in the St. Clair river, the government will take charge of the work. Bids will be opened for this work Oct. 7.

In an interview at Duluth, Col. Dan C. Kingman, United States engineer with headquarters at Cleveland, predicts that added carrying capacity in lake vessels will hereafter have to be sought through beam rather than length. He is quoted saying that he does not expect the government to deepen the channels beyond 21 ft.

Mr. Henry Hess, the chief engineer of the Western Transit Co., of Buffalo, has resigned his position at the age of 70 years, having been with the company since 1856. In 1865 he was made first engineer of the steamer Mohawk, and since that time has sailed on nearly all

the steamers of the company's fleet. It is said of him that he never missed a trip.

With all her pumps working, the wooden steamer Progress, bound from Ashland to Cleveland with iron ore, put into Detroit with six feet of water in her hold. A 3-in. perch found in the hold showed how dangerously the vessel's seams had been opened in the buffeting which she did in Sunday's gale on Lake Huron.

The Lake Superior & Southeastern has bought a large frontage of harbor land on the Wisconsin side of the head of Lake Superior, in the upper bay, and will improve it for terminals at an early day. The road has not let its contracts for building the section north to Duluth but will do so shortly. Its land contracts for rights of way are being taken up gradually and will all probably be closed during the next thirty to forty days.

A number of changes have been made in the masters of the Pittsburg Steamship Co. Capt. W. K. Hunt, who has been sick for some time, returns to his old boat, the James Watt, and Capt. J. A. Noble, who has been on the Watt, takes the Maritana. Capt. C. D. Secord, formerly master of the steamer Harvard, whose license was suspended for sixty days, has been appointed master of the A. B. Wolvin. Mr. Toner, who was chief engineer of the big steamer Corey, has been made shore engineer, making three men that the company has ashore in that department.

The Bucyrus Co., South Milwaukee, Wis., is desirous of announcing that it is in no way interested in the new Duluth-Superior Dredging Co. As the company is in the business of building dredges for anybody and everybody, it is a part of its fixed business policy not to take stock in any dredging company. In its issue of Sept. 14 the *Marine Review* stated that Mr. R. B. Knox, brother of the vice president and general manager of the Bucyrus Co. was connected with the Duluth-Superior Dredging Co., and that it was generally supposed that the Bucyrus Co. was interested in the venture. The Bucyrus Co. desires to say that it is not in any way interested.

An exhibition was given at Detroit last week of the Mayo life boat, designed by the Mayo Life Boat Co. of Toledo. The boat is the invention of Mr. R. D. Mayo, who has been for thirty years or more in the life saving service on the great lakes. The Mayo life boat is cylindrical in shape like an elongated barrel with rounded ends and has a seating capacity for forty passengers. The outer shell of the Mayo boat is steel, revolving around a self-adjusting passenger carriage in which the passengers sit always in an upright position. Only in case of fire is it necessary to launch the Mayo boat. In other cases the passengers simply enter the boat and wait for the vessel to sink, leaving the life boat afloat. The lines may be cast off from the interior of the boat.

Among the corporations organized in Maine last week is that of the Lake Torpedo Boat Co. Four separate certificates of organization were drawn up, one each for England, Germany, Russia and Italy. The purpose of the company is to manufacture and deal in submarine torpedo boats, torpedoes, guns and other devices relating to submarine war vessels. The capital stock of the corporation is \$1,000,000, but nothing appears to have been paid in. The officers are: President, Fred P. Whitney, Washington, D. C.; treasurer, W. S. Lee, Augusta, Me. These with Henry J. Miller, of Elizabeth, N. J., E. E. Penney and A. P. Bibber, of Augusta, Me., constitute the board of directors.

The Hamburg-American Steamship Co.'s first turbine steamer the Kaiser underwent a successful trial trip last week, averaging 20 knots.

AN INGENIOUS PIECE OF ELECTRICAL MECHANISM

On all the new warships of the navy there is installed what is known as the Long Arm system of electrically operated bulkhead doors and hatches. The heart of the

system is the central emergency station from which the doors and hatch plates may be closed by starting the motors with which they are equipped. The working parts of the station are contained in a two-part water-tight case secured to the side wall of the pilot house or other convenient place above decks. The apparatus of the station consists of three parts:

First — The mechanism for controlling the circuits running to each door or hatchgear for closing the same.

Second — The lamps which indicate the closure of each door or hatch.

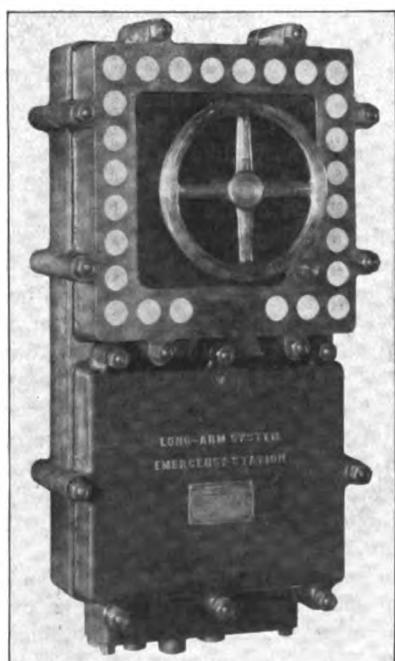
Third — The fuse box in which each entering wire is supplied with its proper fuse.

The accompanying photographs show the emergency station closed and with the protective covering removed.

To operate the emergency station the officer in charge releases a hand wheel, which, in turn, releases a gear driven by a powerful spring and controlled by a suitable escapement. This gearing closes the circuits for operating the emergency switches located in the controller of each door and hatch gear. In performing this function the gearing does not start all the motors at the same instant for the reason that this would demand a large supply of current from the ship's generators. It starts them one after the other at about a three-second interval, so that it rarely happens that more than four motors are in operation at any one time, although the entire closure of twenty-four doors and hatch gears controlled from



EMERGENCY STATION OPEN.



EMERGENCY STATION CLOSED.

one emergency station may be accomplished normally in about a minute and a quarter. When, however, an extremely quick closing of all doors is required, this time can be reduced to thirty seconds for twenty-four doors by simply using the hand on the wheel of the emergency station to hurry it; and this action does not alter the closing speed of any individual door or hatch.

As each bulkhead door reaches its watertight seat, it automatically closes a circuit running to the emergency station, there connected with one of the small incandescent lamps. Transparent discs over these lamps bear numbers corresponding to the numbers of the various doors under control. The officer in charge, by pressing a button, can cause the indicator lamp of every closed door and hatch to glow, thereby assuring himself of the successful operation of the emergency action. If any door is prevented from closing by obstructions left in its path, this fact at once is apparent to the officer in charge, and no time need be lost in reaching the scene of the difficulty.

The emergency station contains but one spring, which furnishes the entire power for operating the device. This spring is of the helical type and of ample strength for the work it is called upon to do.

Although the experience of hard sea-service has shown that the emergency station of the Long Arm system can be depended upon for successful operation at all times to guard against the possibility of failure, the mechanism can be actuated at any time by turning the hand wheel located in front of the case should the station fail to act automatically by the power of the spring when released. During any emergency period a red indicator lamp glows continuously, so that a casual glance at the emergency station shows at once whether the emergency is "on" or "off." After a danger period is passed, and it is desired to again establish normal conditions below, the emergency may be thrown off by a hand reversal of the same operating device which is used to throw it on, so that the mechanism when not in use is always set ready to operate and always available in time of need.

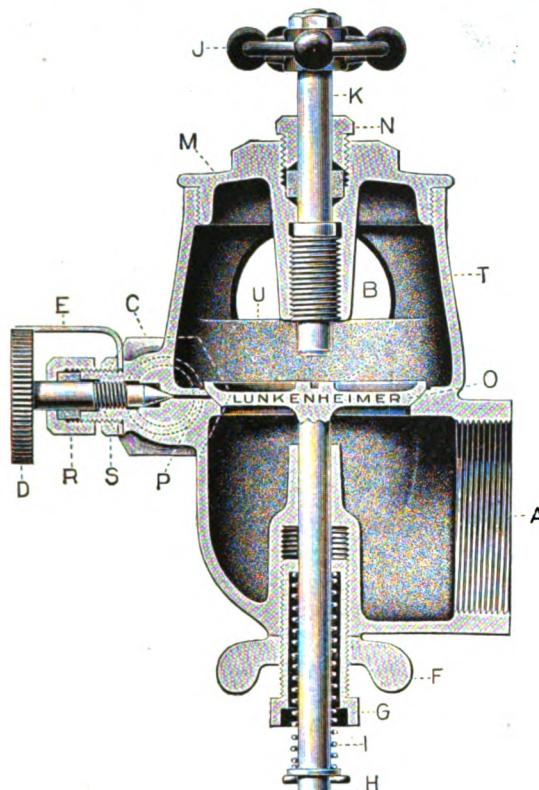
COMPASS DEVIATION CORRECTOR

Mr. Benjamin V. How, 106 Tremont street, Boston, is introducing Arbecam's alidade adjustable compass deviation corrector, position and distance finder, in the United States. This is an entirely new instrument for use on board ship. It is readily attached to any binnacle. It takes the place of several instruments now in general use and besides does what no other one will do, instantly corrects any deviation of the compass. It is invaluable to the navigator in taking bearings, cross bearings. It is unaffected by vibration, rolling or pitching and adjusts itself to every motion of the vessel. The compensating attachment for the correction of the deviation of the compass is a contrivance of the greatest importance and value to the navigator, as it precludes the possibility of making a mistake in applying the deviation and but one operation is necessary to compensate all bearings for the ship's heading. The attachment consists of a pointer and a graduated segment of a circle, the graduations extending 15 degrees east or west, as marked on the plate. The pointer is secured at the middle line of these divisions, bringing the telescope and pointer or needle supported on the compass dial in the same vertical plane. A descriptive booklet, giving testimonials, will be sent by Mr. How to any one interested upon request.

The Parsons Marine Steam Turbine Co. has established an American agency at No. 97 Cedar street, New York.

AN IMPROVED GENERATOR VALVE

An improved form of generator valve has lately been placed on the market which embodies a number of desirable and important features highly appreciated by users. The sectional view herewith clearly illustrates the construction of the valve. One of its principal features is the easy regulation of the spring which holds the disc to its seat. This regulation can be easily accomplished while the engine is running, and without in any way interfering with the proper operation of the valve. It is only necessary to loosen the thumbnut F when the sleeve G can be screwed up or down to loosen or tighten the ten-



IMPROVED FORM OF GENERATOR VALVE.

sion of the spring, after which the thumbnut F is again tightened.

It has been found that gasoline engines work best with the generator valve disc spring set at some particular tension; but as this particular tension cannot be ascertained except by trial, when the engine is in operation, it is necessary that provision be made for the easy adjustment of the spring while the engine is running, which important feature will be found in this improved form of generator valve. The lift of the disc, and consequently the speed of the engine, is regulated by means of the stem K operated by wheel J.

Another important feature in the design of this valve is the light but strong construction of the disc. One of the troubles experienced in generator valves, is the tremendous wear on the seat and the breaking of the disc. To overcome this objection, the seat opening in this improved valve is very large, the area being considerably in excess of that of the inlet A. It is not necessary, therefore, that the disc be raised very far off its seat to permit a full charge of air and gasoline to enter the cylinder. The movement of the disc being but a trifle, the shocks caused by seating are reduced to a minimum, and users claim they have had no trouble owing to the valve leaking or discs breaking. The disc can easily be reground when worn by removing the cap M, and inserting a screw-

driver or other flat instrument in the slot in the top of the disc provided therefor.

The valves are made of a very high grade of bronze composition, and the metal is so distributed about the valve, that those parts subjected to the greatest strain are made heavier in proportion. Owing to the oxidizing effect of gasoline on iron or steel, these materials are entirely eliminated.

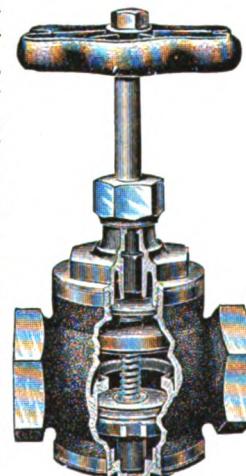
The supply of the gasoline is controlled by the needle valve D, the end of which is placed as near as possible to the outlet of the gasoline into the valve, very little clearance being allowed. The result is that the gasoline is injected in the form of a spray, thus vaporizing thoroughly with the air admitted through the air inlet A. This needle valve has a long taper bearing and the threads on the stem are of fine pitch, thus very close adjustment can be secured and the amount of gasoline injected can be regulated to a very fine degree.

The wheel handle D is engraved with numbers to show the different degrees of opening. This wheel handle has a flat spot on its periphery with which the spring E engages. The object of this is to enable the operator, after he has properly adjusted the needle valve for the correct mixture, to at any time easily obtain this same adjustment, should he close the needle valve or open same beyond the proper setting. No matter where this flat spot may be, after the needle valve has been set, the spring E can be brought to bear on same by loosening the lock-nut S, which will permit of the free turning of the spring. The union C is provided on the gasoline inlet to facilitate its connection.

This improved generator valve is the result of considerable experimenting on the part of the Lunkhenheimer company, which is the manufacturer. It has recently issued an attractive pamphlet on generator valves, which is sent free to any one requesting a copy.

A DOUBLE SEAT, DOUBLE-DISC VALVE

The valve shown in the accompanying illustration is claimed by its maker, the National Valve Co., Milwaukee, Wis., to be the only double-seat, double-disc valve in the world. The valve consists of two discs which are brought together by the threaded stem, and close on either side of the seat. The construction is shown quite clearly in the cut. The valve is claimed to have about double the seat area found in a valve of the ordinary type, and it is positive in its action and effect. The disc surfaces are flat and come together without any twisting motion, and therefore there is no wear on the valve seats.



DOUBLE-DISC VALVE.

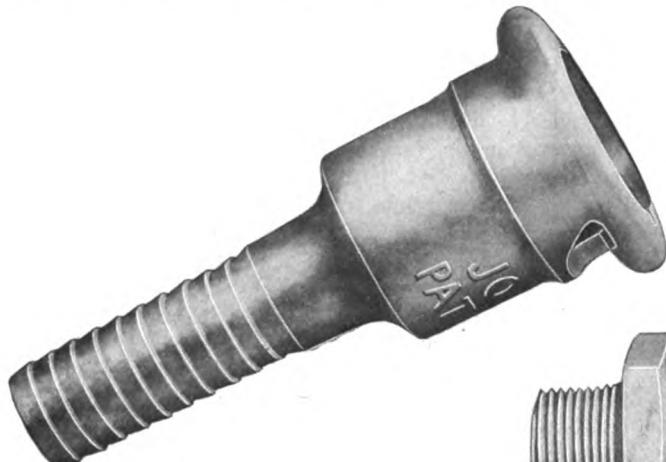
The following bids were opened recently at the navy department for the construction of a steel light vessel: Maryland Steel Co., Baltimore, Md., \$138,244, or \$131,000 on bidder's specifications, or \$129,500 with certain omissions; Harlan & Hollingsworth, Wilmington, Del., \$124,600, or \$115,990 on bidder's specifications; Craig Ship Building Co., Toledo, Ohio, \$123,400, or \$119,400 on bidder's specifications; Pusey & Jones, Co., Wilmington, Del., \$162,700, or \$152,700 on bidder's specifications; New York Ship Building Co., Camden, N. J., \$154,000, or \$146,000 on bidder's specifications.

THE JOY AUTOMATIC HOSE COUPLER

The National Pipe & Hose Coupler Co., Detroit, Mich., has recently put on the market a hose coupler shown in the accompanying illustration. The maker claims that this is the tightest hose coupler known. A joint can be made with extreme rapidity and can be made in only one

aptly called the lead bottle battery for the reason that it consists of a completely enclosed lead bottle which is of the 2-volt 30-ampere-hour type, as shown in the illustration herewith. By connecting a number of these units batteries of any capacity may easily be formed.

For ignition work, the 6-volt 30-ampere-hour battery



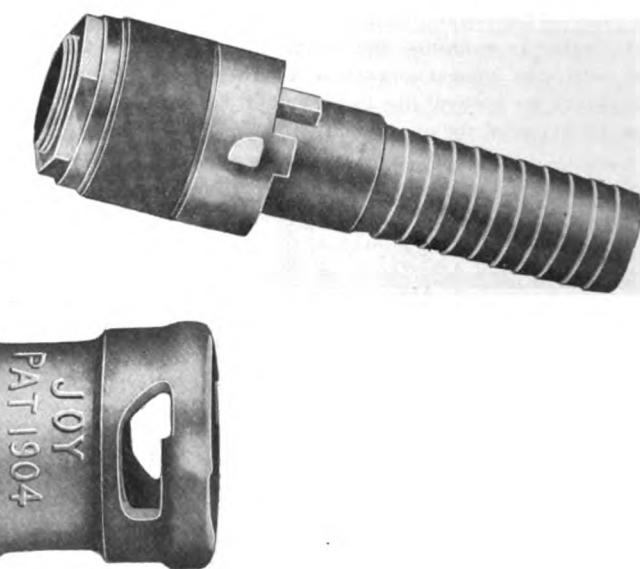
JOY AUTOMATIC HOSE COUPLER.

way. The union is formed by a cam in one end having offset lugs. A quarter turn with one hand drives these lugs home. The cam compresses the washer longitudinally and thereby expanding it laterally. The washer is the integral part of the coupler and cannot be lost. When worn out it is only necessary to unscrew the hexagonal nut from the coupler and replace the washer. The coupler is particularly handy in car building shops, ship yards, mines, bridge building, railroad shops and structural iron work. When the sockets are near the floor or in dark places the connections can be made by the sense of touch. It is merely necessary to insert the coupler in the socket and make a quarter turn until it snaps. The joint is then tightly made and there is no guess work or crossing of threads. A quarter turn in the other direction uncouples it.

STORAGE BATTERY FOR IGNITION AND LIGHTING

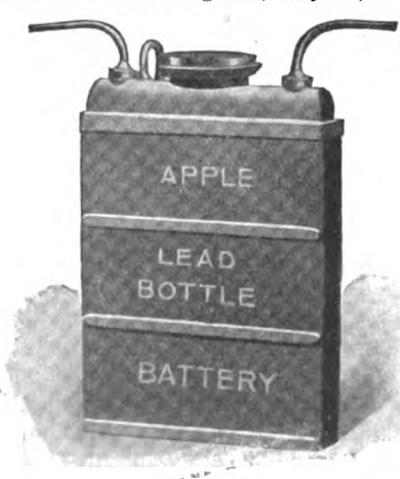
Launch owners are always interested in any new device which pertains to the gasoline engine. The Dayton Electrical Manufacturing Co., Dayton, O., which for the past

nine years have been manufacturing and marketing their well-known line of Apple ignition apparatus, have brought out a new type of storage battery for ignition and lighting work that is proving satisfactory in every respect. This battery is

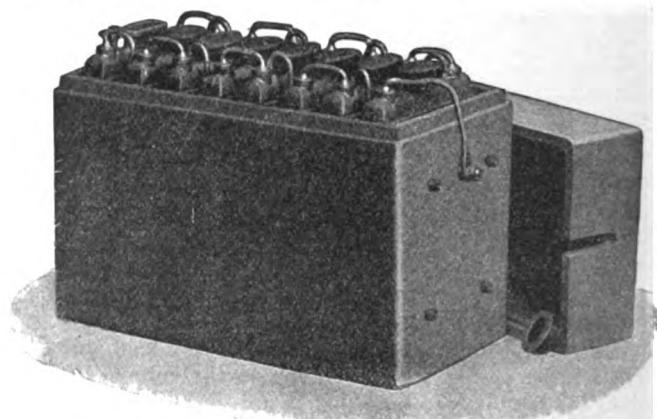


consisting of three units is most serviceable, while for ignition and lighting work a 6 or 8-volt battery of the 60 or 90-ampere-hour type is most serviceable.

The makers of this new battery claim that it is the ideal storage battery for marine work, as each unit is completely enclosed and unbreakable so that when in a heavy sea there is no slopping over of destructive elec-



APPLE STORAGE BATTERY.



APPLE STORAGE BATTERY.

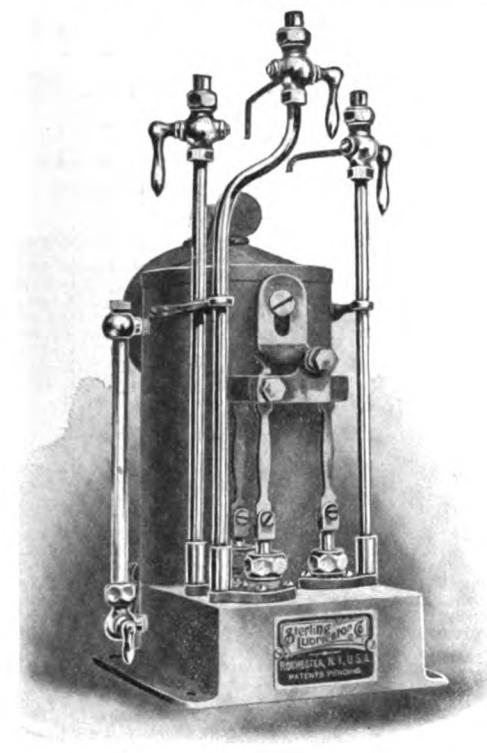
trolyte, as commonly happens with the open type of battery.

A rubber tube acts as a controlling vent for the acid fumes that may be generated by the chemical action of the battery, and by this means the vapor may be carried overboard instead of being condensed on top of the battery. The Apple lead bottle unit battery is light in weight in proportion to output, and gets rid of all the difficulties attendant upon the use of glass or rubber contained accumulators.

The thirty-fourth annual meeting of the National Board of Steam Navigation will be held at the Merchants Exchange, St. Louis, beginning Tuesday, Oct. 31.

STERLING FORCE FEED LUBRICATORS

The Sterling Lubricator Co., Rochester, N. Y., are manufacturing force feed lubricators, two of which are shown in the accompanying illustrations. The distinctive feature



STERLING FORCE FEED LUBRICATOR.

of these lubricators is that the pumping mechanism is placed upon the front side, making it easy of access for cleaning, repairing and adjusting. On the back side of the lubricator is placed the driving mechanism. The main shaft passes through the body of the lubricator and permits of very long bearings where they are needed. The rocker oscillates on a long bearing extending into the oil reservoir. The driving lever is on the back, permitting free and easy access to the pump and to the rocker at any time while the lubricator is in operation. The throw of this lever may be easily and quickly altered by means of the adjustment clamp on it.

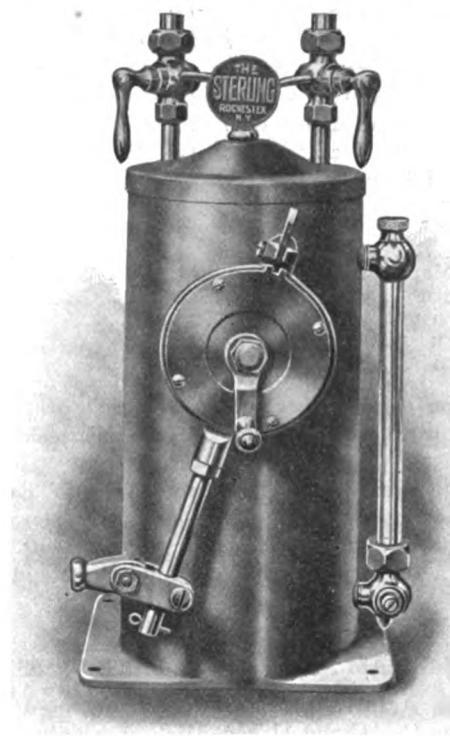
If it is desired to operate the lubricator while the engine or machine which it feeds is at rest, or before starting, or in case more oil is needed momentarily while the machine or engine is in motion, a hand attachment is provided. The use of this attachment does not disturb any of the adjustments. This feature does away with a separate hand oil pump.

A particularly noticeable feature of this type of lubricator is the rocker. This permits of a large range of discharge or stroke of the pump, hence any pump may be independently adjusted. The stroke may be varied from zero to full stroke, or to any intermediate point without disturbing any adjustment. The rocker is provided with graduations, which enable one to ascertain at a glance the exact quantity of oil any pump is feeding.

The pumps and valves are self-contained and separately secured to the oil reservoir. They may be quickly and independently removed for inspection, cleaning or repairing without disturbing any other pump or dismantling the lubricator. Vacuum check valves are furnished with each lubricator, one for each feed. These check valves are placed as near the steam pipe as possible when they are installed, and are so constructed that the valve will open

under any pressure above vacuum. With these check valves in the oil line there is no danger of the oil being siphoned out when the engine is idle, nor will the oil be siphoned out by the vacuum in the cylinders of condensing engines. The lubricator is made in quart, half-gallon, and gallon and two-gallon sizes, with single, double, triple and quadruple feeds. Each feed can be regulated without disturbing any other.

The illustration in Fig. 1 shows a front view of the double feed lubricator. In this lubricator the double rocker is provided with a long slot that each pump can be adjusted independently of the other. Fig. 2 shows a rear view of the lubricator fitted with a roller friction clutch driving mechanism. This clutch is noiseless and positive. It is provided with four rollers, which are held



STERLING FORCE FEED LUBRICATOR.

in contact by suitable springs, and is particularly adapted to high speed engines or to places where the noise of the ratchet wheel is objectionable.

The David Bell Engineering Works, Buffalo, N. Y., state that for the last few years they have been confining themselves exclusively to the manufacturing of steam hammers. In this connection they have made a number of improvements in the standard type of guide steam hammers. These improvements consist of reinforced guides and stiffened column construction. The makers state that their prospective customers consider these points very valuable. Three large sized hammers of this type have been shipped to the government at Panama, in addition to the hammers which they have also furnished for the Boston, New Orleans and Mare Island navy yards. In addition to these they have furnished the government with two hammers for making very heavy stud chain of sizes up to that made of 3 in. round iron. Hammers have also been furnished the Pennsylvania railroad, the Buffalo Dredging Co., and the English contractors, S. Pearson & Sons, who are building the Pennsylvania railroad tunnels in New York city.

JAPAN'S MERCHANT MARINE

Consul General Willis of Yokohama advises the department of state that the Toyo Kisen Kaisha (Oriental Steamship Co.) is contemplating establishing a line of steamers between Hongkong and Chile, touching at Noji, Kobe and Yokohama. The company expects to charter two steamers of 4,000 tons each early in October, 1905. This line is to carry Chinese and Japanese laborers and general passengers to the South American states, and return with cargoes of nitrite of soda and other articles to Japan and China. Should these two steamers find profitable employment, the company intends to increase the number to six of about the same tonnage.

In addition to the foregoing, the company has contracted with Mitsu Bishi Shipbuilding Yard at Nagasaki for the construction of two steamers of 12,000 tons each, to be completed in December, 1907, and June, 1908, respectively. These two steamers when completed will be placed on the company's Hongkong-San Francisco line. Other vessels now under construction and to be completed within this year at the Mitsu Bishi Ship Building Yard are as follows:

Name.	Tonnage.
Iki Maru	1,500
Tsushima Maru	1,500
Taishima Maru	1,250
Tetsurei Maru	2,100
Joshin Maru	1,200
Bazan Maru	1,200

In addition to the foregoing, two vessels are ordered, materials for which are on the way to Nagasaki. They are to be of 7,463 and 1,530 tons, respectively.

The Japan Railway Co. (Nippon Tetsudo Kwaisha) will spend about \$500,000 to purchase three steamers in the near future. These vessels will run between Aomori, the northern terminus of the company's line, and Hakodate.

DAKE STEAM STEERER ON LAKE VESSELS

The Dake steam steering gear, manufactured by the Dake Engine Co., Grand Haven, Mich., has been designed to meet the wants of both tug and vessel owners for a light, compact and efficient machine for pilot house service. It consists practically of two standards on a flat base, supporting a shaft carrying a chain wheel for rudder chain, and also a hand steering wheel. In practice, this steering wheel shaft carries also a gear which is driven by pinion on the engine shaft.

The engine, which is of the well known Dake type, is made to start, stop or reverse by means of a lever connected to the hand wheel, which is not keyed to the shaft, but revolves loosely on same, and it requires only a slight movement of the hand wheel to port or starboard to start or stop the gear at any point.

Arrangements are made to change the gear from steam to hand power in a few seconds; first, by placing a pin, provided for this purpose, through the outer collar and hub of hand wheel; second, by lifting the throttle lever from wheel and sliding out intermediate pinion, which is placed on a feather key.

The gear is equipped with an automatic closing device consisting of a traveling nut, which locks into two stationary ones and closing the steam valve at the hardover points of quadrant. These lock nuts can be adjusted to allow the right quadrant travel. The gear is furnished also with a hand lever attached to throttle valve, and it is optional with the pilot to use either this lever or hand wheel for steering. An indicator is also supplied which

shows the position of the rudder at all times. Following are the over all dimensions of the Dake steering gear.

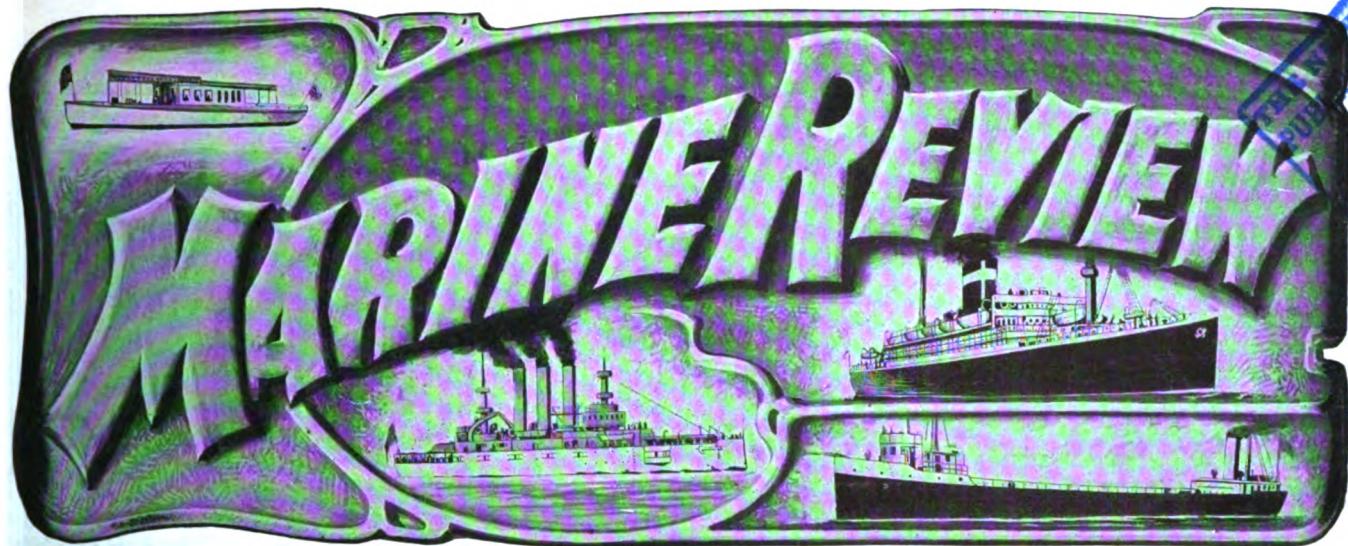
No. of Gear	H. P. of Engine	Size of Base	Length over all	Height to Center of Wheel	Dia. of Hand Wheel	Size of Chain	Weight of Gear	Price
No. 1	5	34 x 26	27 in.	28 in.	37 in.	7-16 in.	850 lbs.	
No. 2	8	27 x 29	31 in.	29 in.	48 in.	9-16 in.	1050 lbs.	

The list of steamers and tugs on the great lakes equipped with the Dake steam steering gear is as follows:

Steamers.	Size of Keel gear. beam.	Owner.	Address.
Ottawa	106 x 20.	E. C. Dunbar, Grand Haven, Mich.	
M. B. Grover	272 x 40.	M. A. Bradley, Cleveland, O.	
Chequamegon	112 x 22.	Chequamegon Bay T. Co., Duluth, Minn.	
Huron	184 x 32.	Grand Trunk Ry., Detroit, Mich.	
Bayfield	2	Marine & Fisheries, Ottawa, Canada.	
John Johnson	1	U. S. Lighthouse Board, Detroit.	
R. A. Burton	1	Western Sand Co., Chicago, Ill.	
City of Chicago	2	Point Abino Sand Co., Buffalo, N. Y.	
Holland	230 x 33.	Graham & Morton T. Co., Benton Harbor, Mich.	
Three Brothers	162 x 31.	J. A. White, N. Tonawanda, N. Y.	
Kalkaska	178 x 33.	J. A. Balbick & Co., Chicago, Ill.	
J. D. Marshall	154 x 34.	A. A. Wanwig, Chicago, Ill., 79 Evergreen Ave.	
John Duncan	225 x 37.	H. J. Pauley, Milwaukee, Wis.	
Nyack	231 x 33.	Crosby Trans. Co., Milwaukee, Wis.	
Frank L. Babst	59 x 17.	Empire Limestone Co., Buffalo, N. Y.	
J. H. Farwell	212 x 35.	Pacific Despatch T. Co., Buffalo, N. Y.	
M. T. Greene	155 x 30.	U. S. Gypsum Co., Alabaster, Mich.	
J. S. Blaizer	74 x 17.	Geo. Breyman, Toledo, O.	
A. G. Lindsay	196 x 37.	S. W. Transit Co., Cleveland, O.	
Wawona	200 x 32.	White Star Line, Detroit, Mich.	
Maywood	1	Hart Line, Polatka, Fla.	
		Escanaba & Gladstone T. Co., Escanaba.	
City of the Straits	234 x 36.	D. & C. Navigation Co., Detroit, Mich.	
Helen C.	186 x 35.	J. A. Calbick & Co., Chicago, Ill.	
Business	191 x 34.	J. T. Mathews, Toronto, Canada.	
	2	Northern Nav. Co., Collingwood, Ont.	
	2	Northern Nav. Co., Collingwood, Ont.	
Tugs.			
J. B. Bradwell	1	74 x 17.	Thos. Bradwell, Chicago, Ill.
John F. May	1	76 x 17.	Thos. Bradwell, Chicago, Ill.
Ward	1	63 x 16.	Y. & L. Coal Co., Chicago, Ill.
Field	1	57 x 13.	J. M. Clow Towing Co., Marinette, Wis.
E. M. B. A.	1	71 x 17.	A. Booth & Co., S. Ste. Marie, Mich.
Endress	1	86 x 20.	A. Booth & Co., S. Ste. Marie, Mich.
		A. Booth & Co., S. Ste. Marie, Mich.	
Bob Teed	1	64 x 16.	Chas. H. Hale, Asuland, Wis.
Welcome	1	68 x 17.	Whitney Bros., Superior, Wis.
V. H. Raber	1	81 x 16.	Lake Superior C. & D. Co., Duluth.
Bonita	1	68 x 17.	Graham & Morton T. Co., Benton Harbor, Mich.
W. G. Mason	2	84 x 20.	Great Lakes Tow. Co., Cleveland, O.
Geo. E. Brockway	2	112 x 20.	Great Lakes Tow. Co., Cleveland, O.
G. H. Breyman	1	79 x 19.	G. H. Breyman & Bro., Toledo, O.
	1		Capt. Baker, Buffalo, N. Y.
			John Coffee, Manistique, Mich.
Sarnia	2	66 ft. lg.	Reid Wrecking Co., Sarnia, Ont.
Major Kingman	1	66 x 17.	B. L. Cowles, Buffalo, N. Y.
Sandy Hook	1	132 ft. lg.	B. L. Cowles, Buffalo, N. Y.
A. W. Colton	2	81 x 18.	Great Lakes Tow. Co., Cleveland, O.
Alpha	1	77 x 19.	Great Lakes Tow. Co., Cleveland, O.
George Pankratz	1	72 x 20.	Gaynor Bros., Sandusky, O.
Charles Mann	1		Commercial Tow Boat Co., Boston.
John Dailey	1		Booth, Dailey & Ivens, N. Y. City.
Sidney T. Smith	2	85 x 18.	Sturgeon Bay Stone Co., Sawyer, Wis.
Salvor	2		Reid Wrecking Co., Sarnia, Ont.
Edward Gillen	1	68 x 18.	Lake Superior C. & D. Co., Duluth.
Judge B. Saunders	2		Kelly Island Lime & Tr. Co., Cleveland.
Tessler	1		A. Tessler & Sons, Milwaukee, Wis.
Hector	1		M. J. Hogan, Port Colborn, Ont.
	1		James Pryor, Houghton, Mich.
Inez	1		Great Lakes Dredging Co., Port Arthur, Ontario.
James Adams	1		Great Lakes Dredging Co., Port Arthur, Ontario.
Joe Dudley	1	65 x 15.	Great Lakes Dredging Co., Port Arthur, Ontario.
International	1	80 x 26.	Grank Trunk Railroad Co., Buffalo.
May Graham	1		Frank Perry, Sault Ste. Marie, Mich.
Frank Perry	2		Craig Ship Building Co., Toledo, O.
Florence	1		Hackett Wrecking Co., Amherstberg, Ontario.
	1		Great Lakes Dredging Co., Port Arthur, Ontario.

Mr. Joseph Joplin, chief engineer of the Cleveland Cliffs Iron Co., Ishpeming, Mich., will make a five months' tour of Europe inspecting the various methods of underground mining.

ENGINEERS' NUMBER



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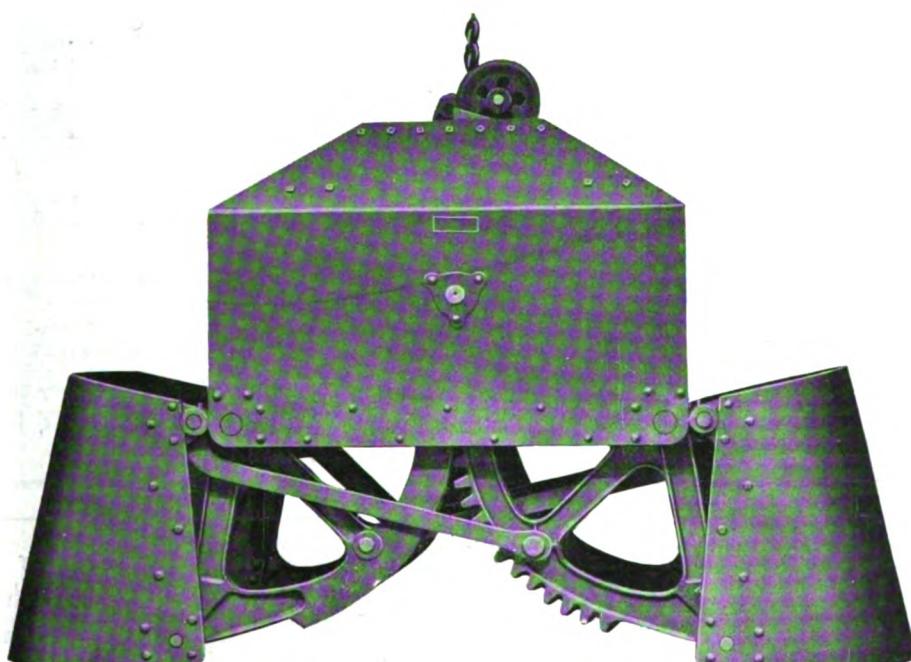
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No. 14.

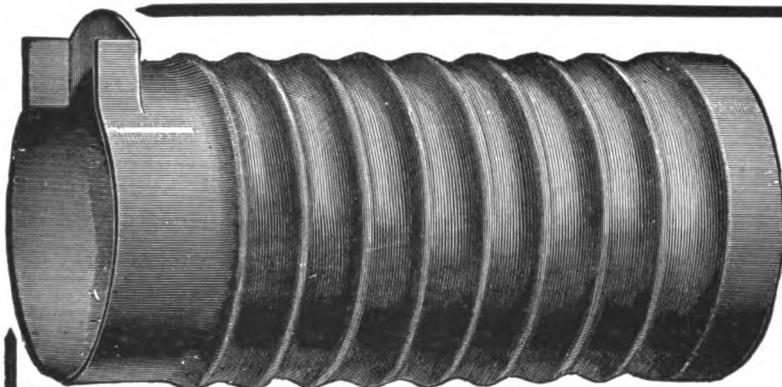
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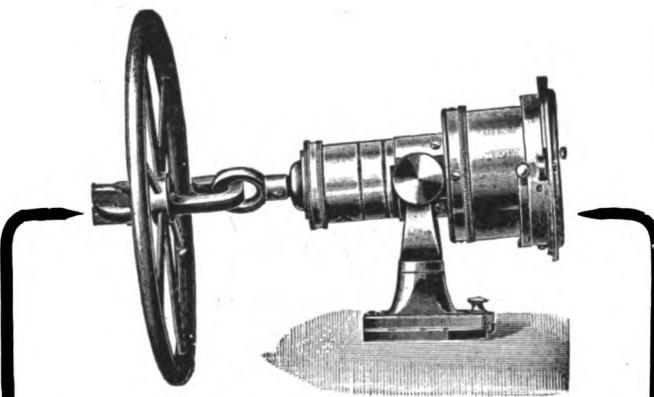
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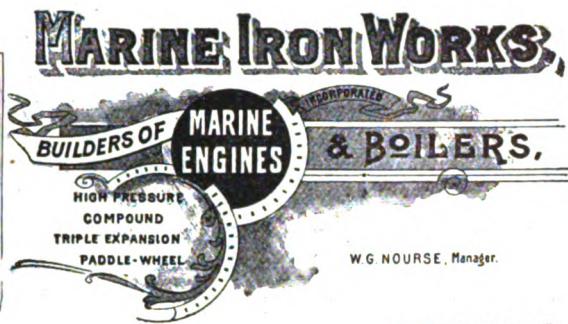
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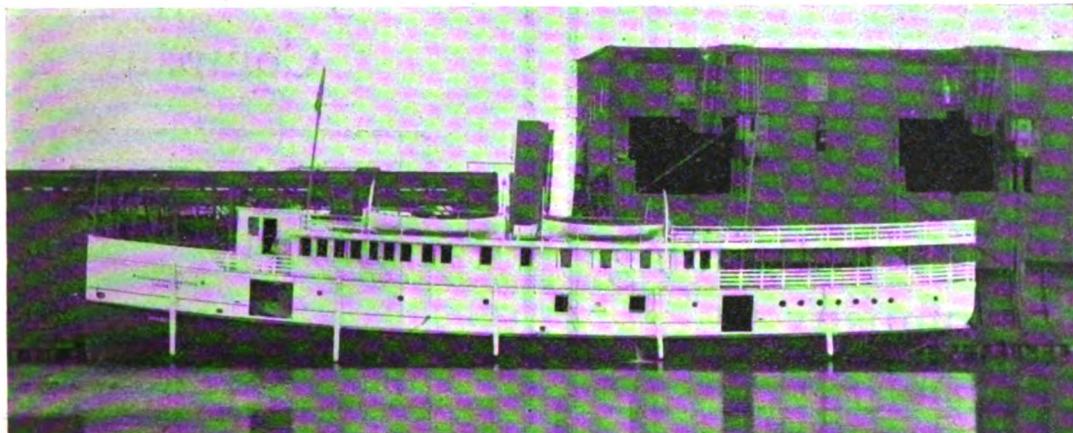
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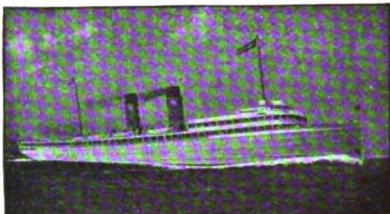
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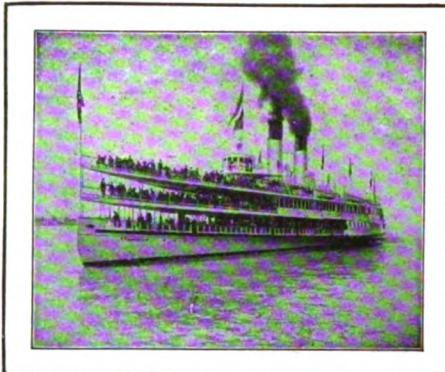
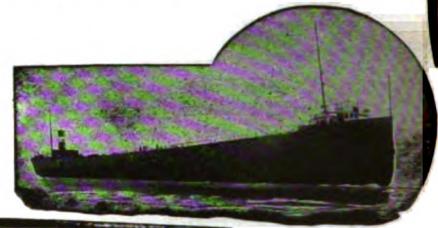
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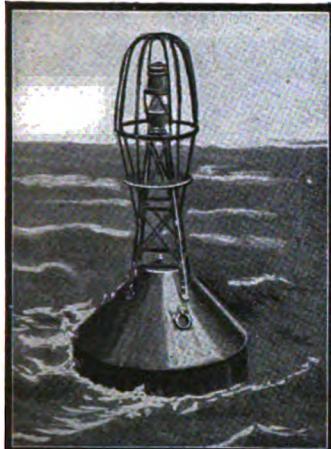
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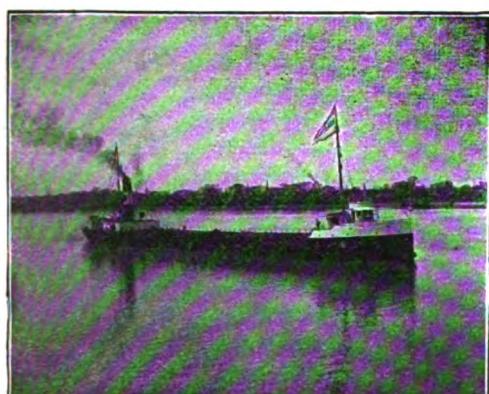
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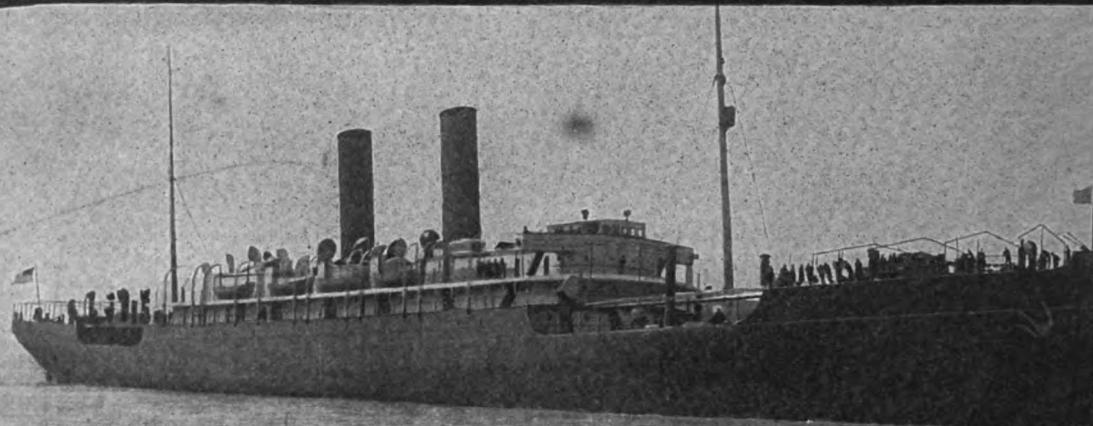
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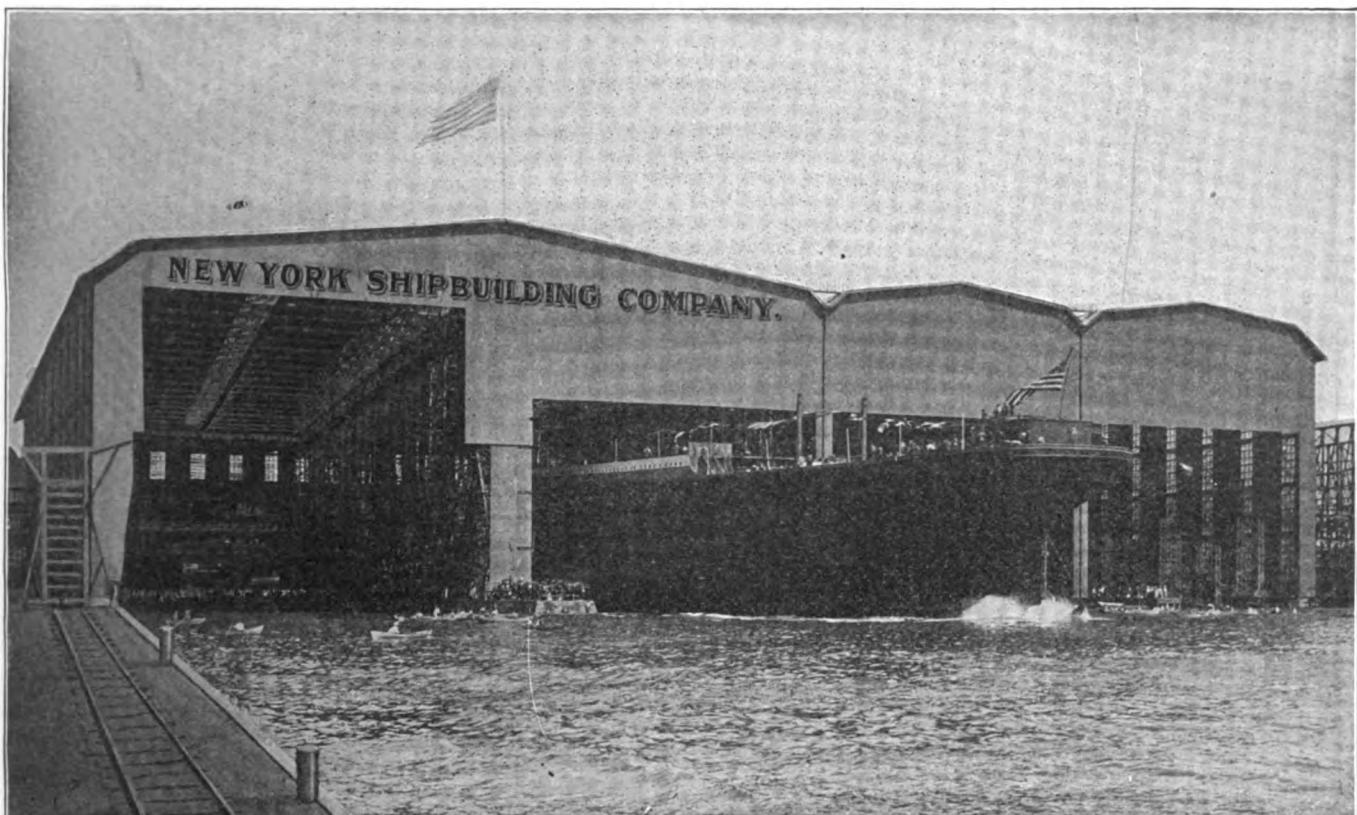
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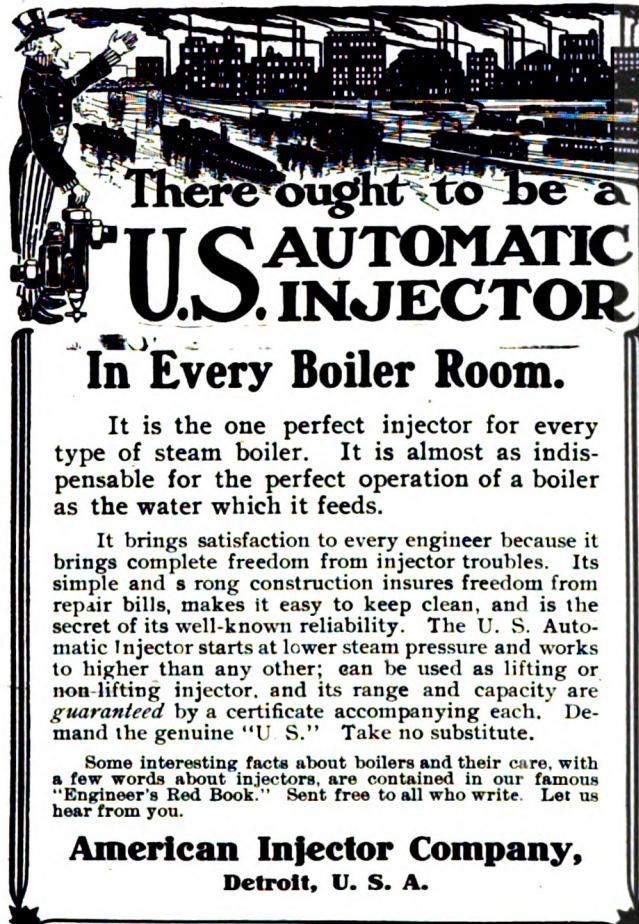
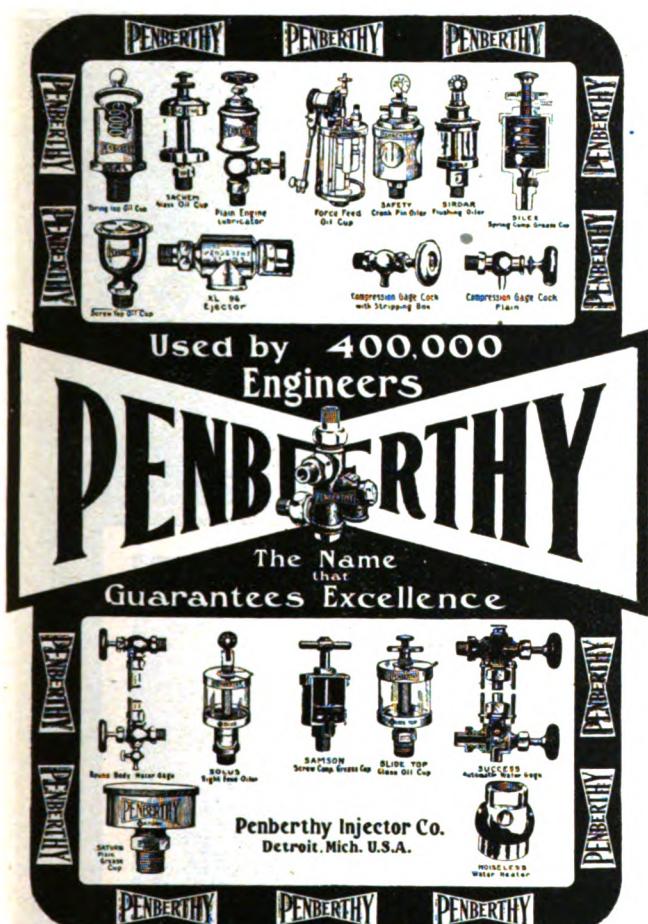
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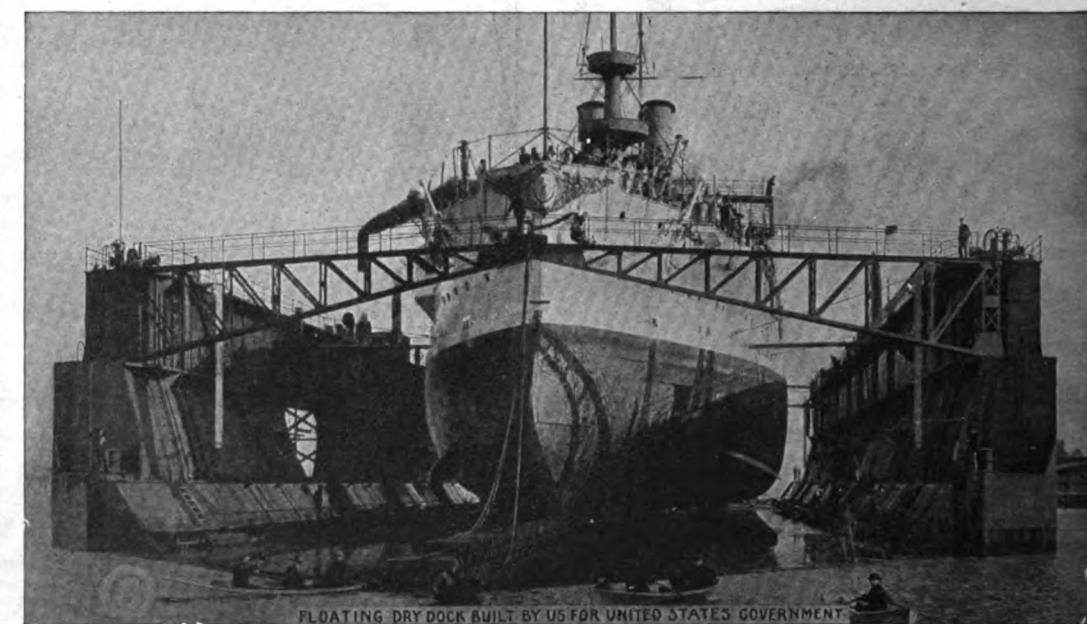
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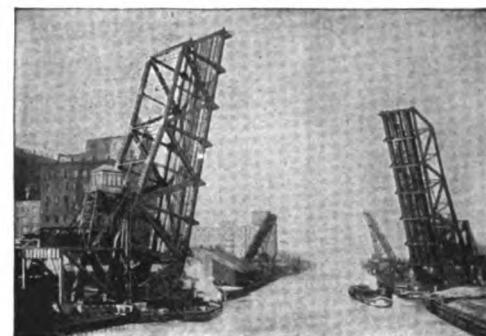
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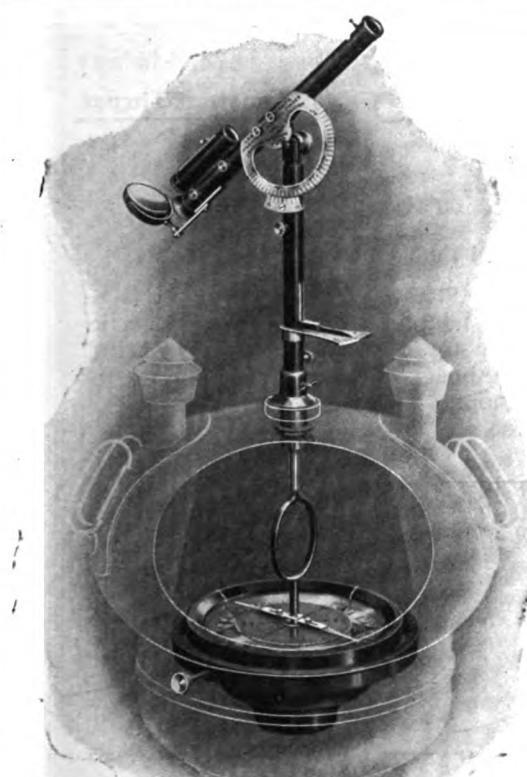
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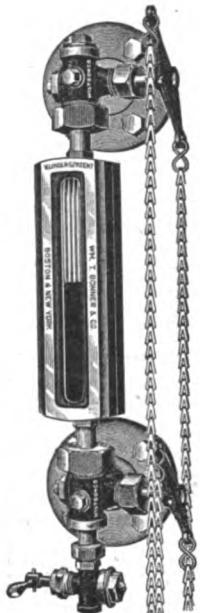
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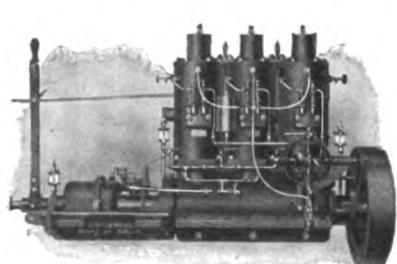
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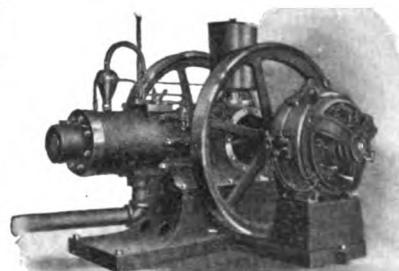
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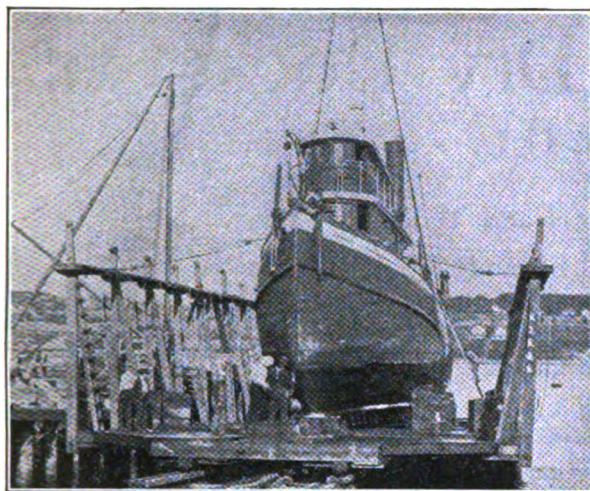
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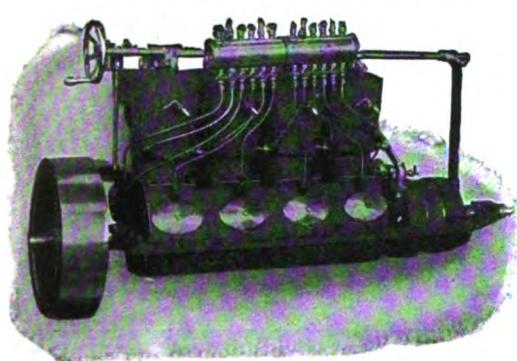
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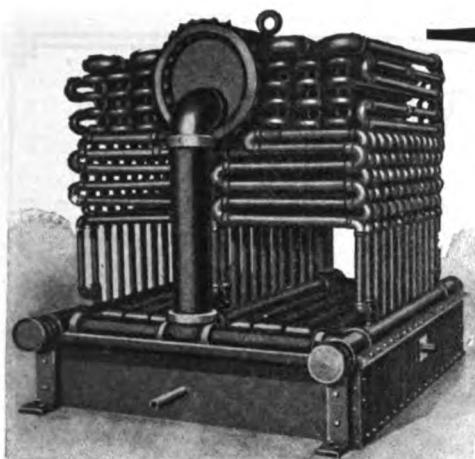
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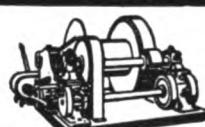
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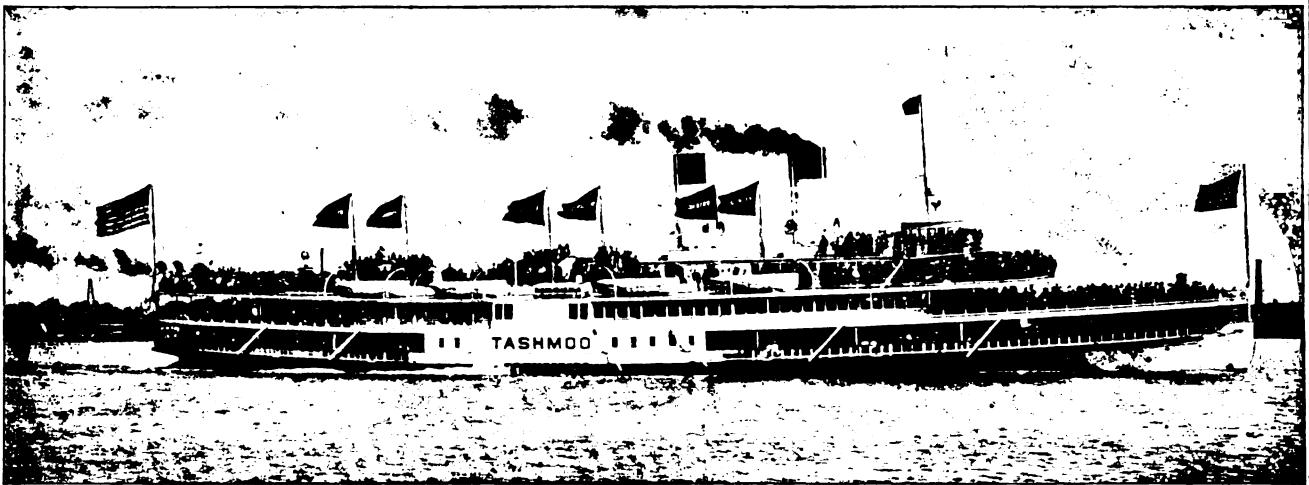


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Holley, Alexander (Whaleback tow-barge).
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Frank E. Kirby at Put-in-Bay.
Lugonda discharging coal at docks.
Lockawanna.
Mahoning.
Manitou.
Majestic. (Three Views).
Michigan Central in Detroit River. (Winter).
Mohawk.
Montana.
W. B. Morley, wreck in Detroit River, Aug. 6, 1899.
Simon J. Murphy. (On the Ways).

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Simon J. Murphy, Launch. (Bow in Slip. Stern not yet in Water.)
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North Land at Mackinac Island. (Two Views).
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North West.
Ontario. (Two Views).
Ontario, in the Ice. (Transfer Steamer).
Pathfinder, in the Locks.
Peerless, at Mackinac Island.
Pere Marquette No. 17.
Plankinton at Northwestern Coal Docks, Duluth.
Pleasure, at Dock (Detroit Ferry).
E. C. Pope.
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W. D. Ross.
Rensselaer.
Ruby Richards, in Ship Canal at Duluth.
St. Lawrence (Thousand Islands).
St. Marie, in Mackinac Straits.
Howard L. Shaw, (On the Ways—Three Views).
Howard L. Shaw. (The Launch).
Howard L. Shaw. (In the Slip).
Sir William Siemens.
George Stone.
Superior. (Steel Trust Tender).
Tashmoo. (In Dewey Naval Parade, Detroit River).
Tashmoo, June 9, 1900.
Tashmoo. (Entering St. Clair Flats—Ship Canal).
Tashmoo. (Landing at Star Island—Two Views).
Thompson, A. D. (Whaleback).
Toronto. (Thousand Islands).
Toronto. (Thousand Islands — at Alexandria Bay).
Toronto. (Thousand Islands — at Canaque).
Transport, in Detroit River, Winter. (Car Ferry—Two Views).
Troy.
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Locking Big Steamer.
Locks showing high and low level.
The Locks.
General View of Locks from Office.
Poe Lock, from below, closed.
Poe Lock, from below, open.
Poe Lock, from above.
Poe Lock, with Whaleback.
Whaleback Str. Pathfinder in the Locks.

St. Marys River, South from the Locks.
Weitzel Lock, from above.
Weitzel Lock, from below.
Str. North Land Passing Locks, two views.
Upper Entrance to Lock Canal.
Gate Mechanism.
Interior of Power House.

Canadian Lock from Upper End.
Canadian Lock from Lower End.
Steamers Entering and Leaving Poe Locks.

The Rapids, looking up.
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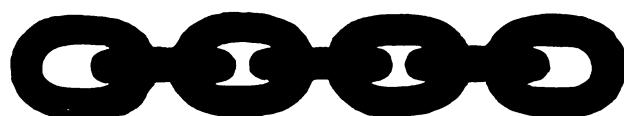
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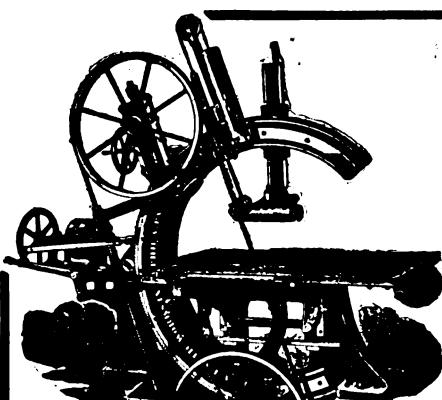
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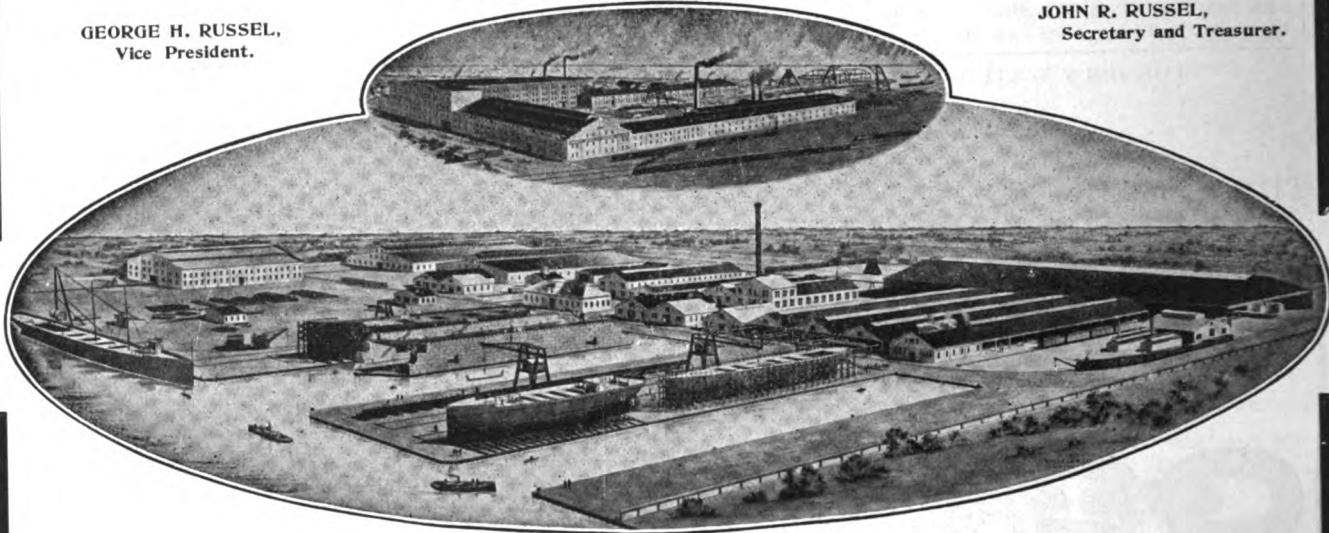
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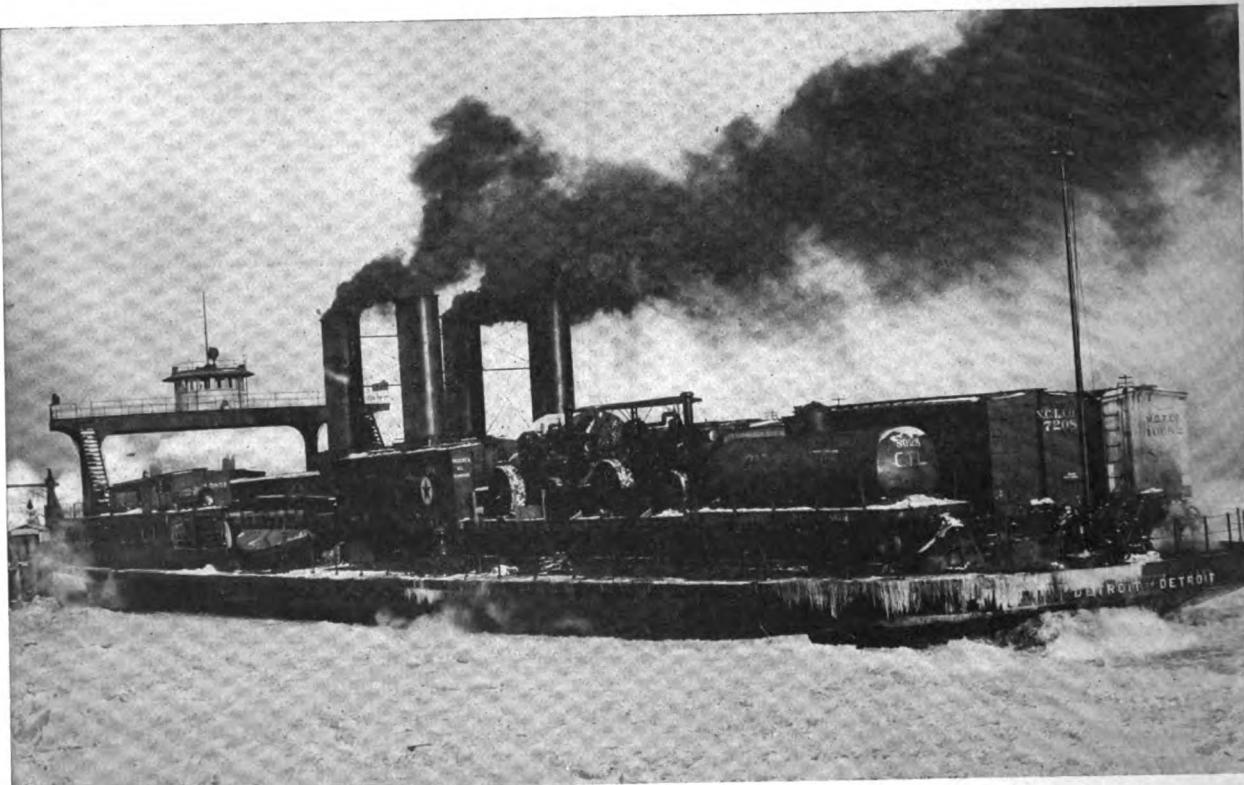
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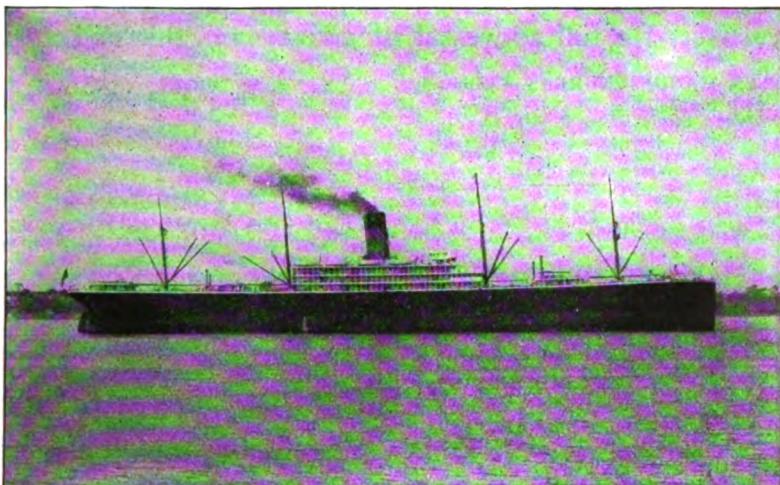
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See accompanying index of Advertisers for full addresses of concerns in this directory.

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Mietz, Aug.New York.

AIR POTS, DEAD LIGHTS, ETC.
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MacDonald, Ray G.....Chicago.
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.....Mariner's Harbor, S. I., N. Y.
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Willard, Chas. P. & Co. Winthrop Harbor, Ill.

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Power Specialty Co.....Detroit.

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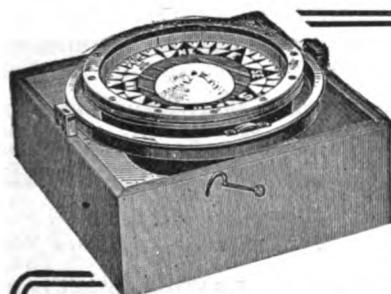
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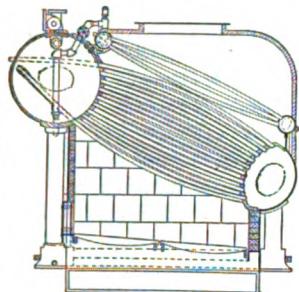
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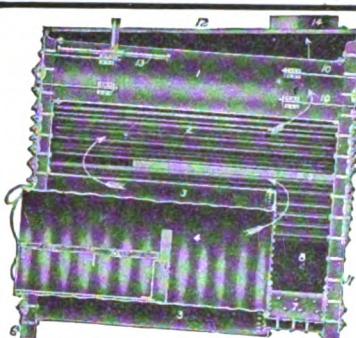


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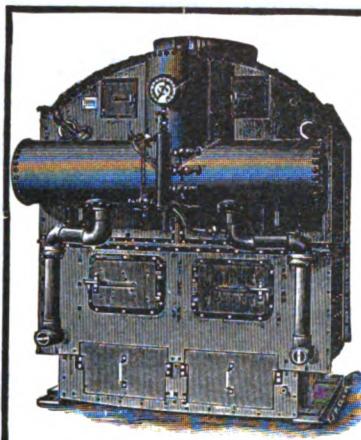


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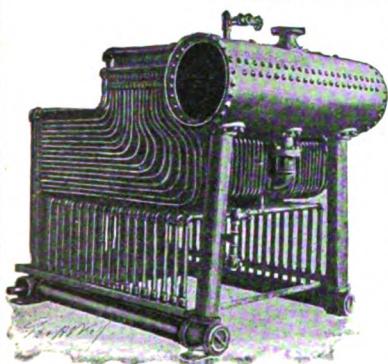
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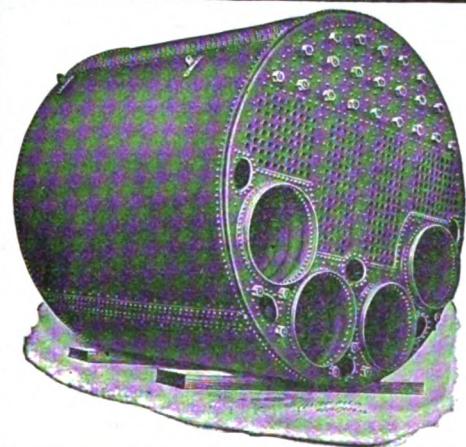
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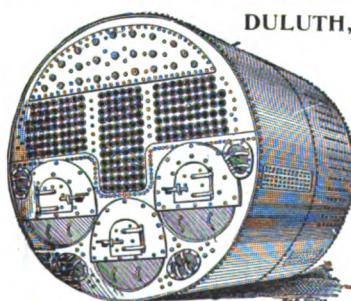


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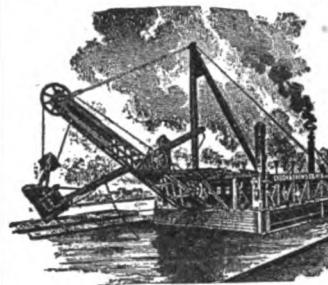
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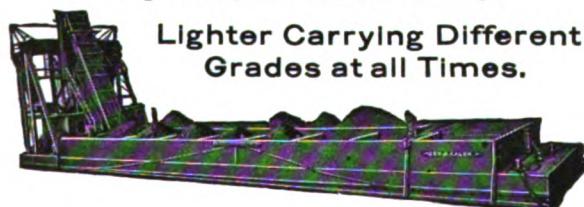
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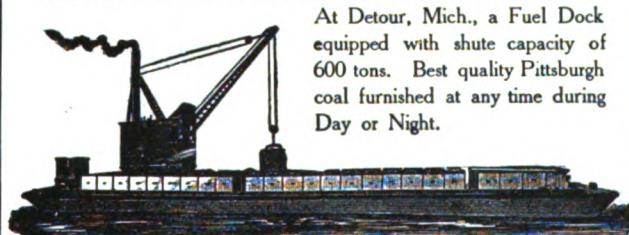
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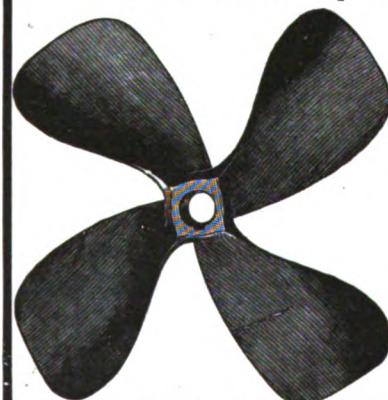


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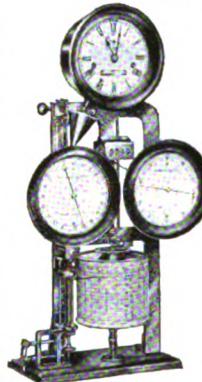
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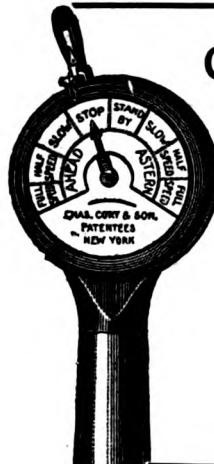
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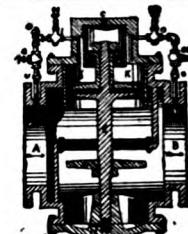
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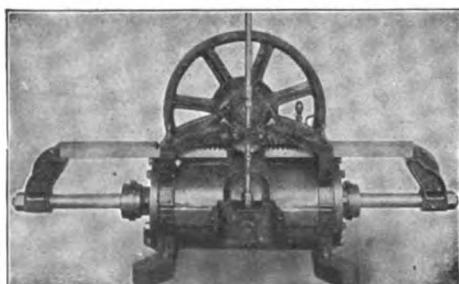
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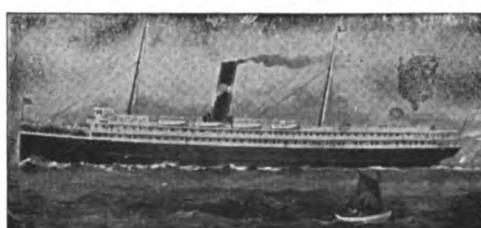
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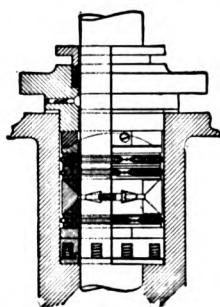
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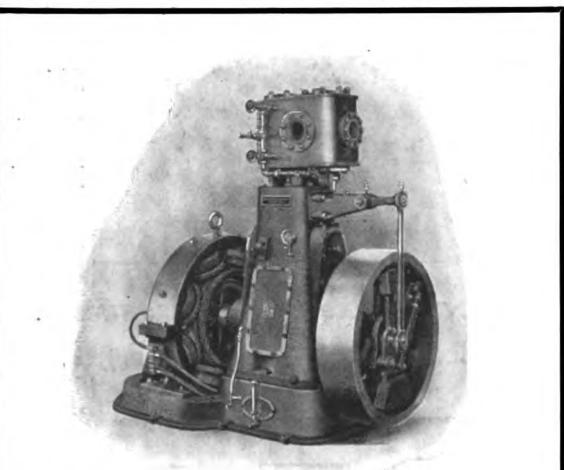
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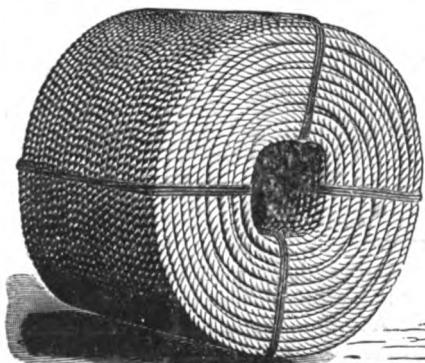
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